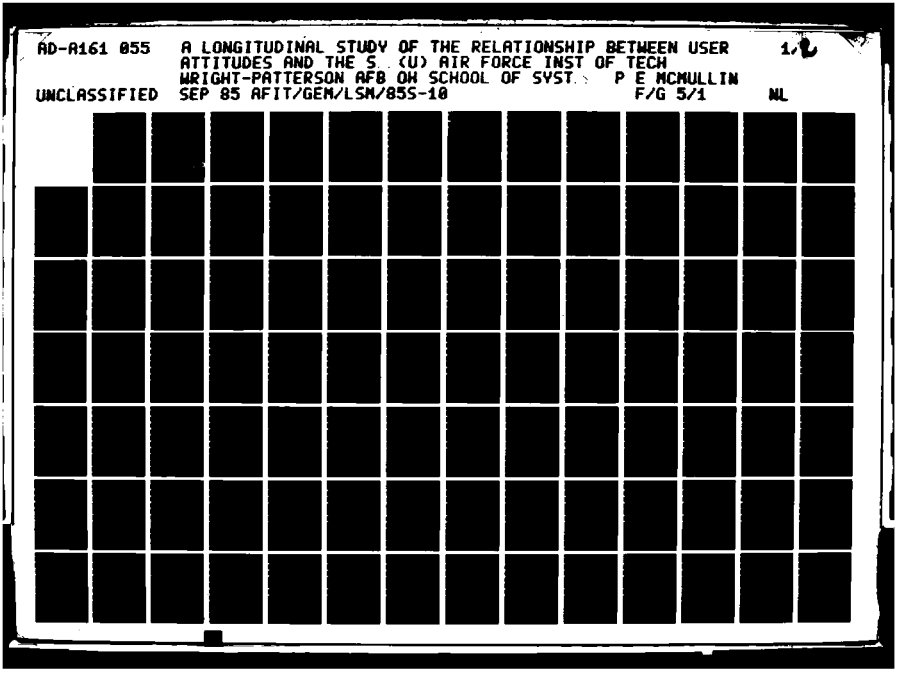
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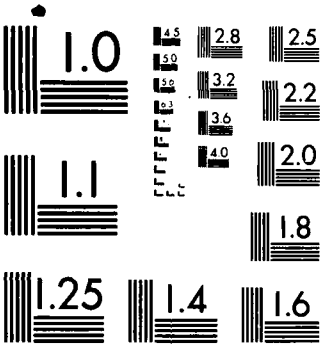

A LONGITUDINDAL STUDY OF THE RELATIONSHIP BETWEEN USER ATTITUDES AND THE SUCCESS OF THE MAJCOM AND AFRCE WORK INFORMATION MANAGEMENT SYSTEM

THESIS

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THESIS

Presented to the Faculty of the School of Systems and Logistics

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Captain, USAF

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Abstract

The Air Force will begin the implementation of the $95 million Work Information Management System (WIMS) during the summer of 1986. The overall objective of WIMS is to provide managers with better information for making decisions, and to improve the productivity of the Air Force Engineering and Services personnel. The success of WIMS will be determined by the degree to which the Air Force is able to achieve this goal.

In a 1984 study, AFIT researchers statistically determined that there is a relationship between user attitudes and the perceived success of WIMS. This research determines whether or not the relationship between user attitudes and success has changed over time, and determines if WIMS is perceived to be more successful in 1985 than it was in 1984. Finally, this research evaluates how WIMS has impacted the MAJCOM and AFRCE organizations based on the observations of the users. 400 surveys were distributed to 19 MAJCOM and AFRCEs. Statistical techniques were used to answer the five research questions. A response rate of 55.5 percent was achieved. Results indicate that the relationship between user attitudes and the perceived success of WIMS has not changed significantly, and that WIMS

is perceived to be more successful in 1985 than it was in 1984. In addition, the users most frequently responded that WIMS has positively impacted the organization by enhancing the flow of information throughout the organization. The users also responded that WIMS has negatively impacted the organization by limiting the ability of people to perform their job when the computer system is down. Finally, the users most frequently suggested that WIMS would be more successful if there were a greater number of terminals within the organization and if the quantity and the quality of the user training was increased.

A LONGITUDINAL STUDY OF THE RELATIONSHIP BETWEEN USER ATTITUDES AND THE SUCCESS OF THE MAJCOM AND AFRCE WORK INFORMATION MANAGEMENT SYSTEM

I. Introduction

Overview

In the summer of 1986, the Air Force will begin the world-wide implementation of the $95 million Work Information Management System (WIMS) (1). The overall objective of WIMS is to provide managers with better information for making decisions, and to improve the productivity of the Air Force Engineering and Services personnel (11:2; 10:2). The success of WIMS will be determined by the degree to which the Air Force is able to achieve this goal.

In order for the implementation to succeed, all levels of management must be committed to support the implementation. Major General C. D. Wright, the Director of Engineering and Services at the Air Staff, issued a policy letter in the spring of 1985 which reaffirmed his support of the system. The primary emphasis of his letter was that the successful implementation of the Work Information Management System must be one of the highest priorities for all of Air Force Engineering and Services (9:1).

One research effort in response to this policy was the 1984 Air Force Institute of Tecnnology (AFIT) thesis by

Moschner and Nightengale (31). The purpose of their research was to identify those factors which would promote or jeopardize the successful implementation of WIMS. Their research indicated that there was a positive relationship between user attitudes and the perceived success of the major command (MAJCOM) and Air Force Regional Civil Engineers (AFRCE) Work Information Management Systems (31:142). In particular, the findings from their study indicated that both the users who perceived that WIMS improved their job performance and the users who felt an urgent need for the implementation of the system displayed a higher degree of success than the users who did not possess these attitudes. In their final chapter, the researchers recommended that the relationship between user attitudes and the perceived success of WIMS should be studied to determine if the relationship changes over time. They also recommended that further research should be done in order to identify additional factors that will promote or jeopardize the success of WIMS (31:158).

Using the 1984 thesis as a foundation, this research study determined how the perceived success of the Work Information Management System at the Air Staff, MAJCOM, and separate operating agencies (SOAs) has changed over time. In addition, the impact of the Work Information Management System on individuals in the various organizations was investigated.

Chapter I provides a description of the background and philosophy behind the Work Information Management System. In addition, the chapter includes a section on the problem statement, the scope, and the limitations of the research. Finally, Chapter I outlines the research objectives and the research questions used. The second chapter contains a discussion of the theoretical and empirical literature on management information systems, their methods of evaluation, and their indicators of success. Chapter III describes the methodology that was used in the research. The findings and analysis are contained in Chapter IV. The results were evaluated using the information from the 1984 thesis as a baseline. The fifth and final chapter contains the conclusions and recommendations. Also, in the fifth chapter, suggestions for additional areas to be investigated and a discussion of how the research results can be used to improve the potential for the successful implementation of the Work Information Management System are provided.

Background

The primary mission of Air Force Civil Engineering is to support the flying mission by constructing and maintaining all ground facilities that are directly or indirectly required for "flight operations and those personnel involved in flight operations." (11:1). At the MAJCOM and Air Force Regional Civil Engineer (AFRCE) levels, the responsibility of Engineering and Services is to provide the staff support necessary in "the programming, design,

construction; coordinating; implementing; monitoring; and reporting these mission support requirements" (11:1).

Within the Air Force, and especially in Engineering and Services, the current emphasis is on doing more with less. Within the past few years, there has been a tremendous increase in the number of projects to monitor, the complexity of mission facility requirements, and the speed required to support the new mission beddowns (13:2). Unfortunately, the growth of Engineering and Services staffs did not match the growth of the new requirements. With such a large increase in the amount of information at the different levels of the organization, the vertical communication flow within an organization becomes extremely important. One potential solution to this management problem is the successful implementation of a management information system. The successful implementation of a management information system "increases the capacity of the organization to make use of information" (19:96) that it acquires through its daily operation. In addition, the management information system can benefit the vertical communication of an organization by "increasing the capacity of existing channels, creating new channels, and introducing new decision mechanisms" (19:96).

A management information system (MIS) is a computer-based system designed to provide "information to support the planning, control, and operations of an organization."

(41:296). The goals of a management information system are to increase the speed at which routine tasks can be accomplished, increase the availability and the quality of information needed for decision-making, and to increase the efficiency of the organization (9:3).

Air Force Engineering and Services have utilized various information system at all levels of command. Currently at the base-level, the primary system is the Base Engineer Automated Management Systems (BEAMS) (8:11) which is a batch system. BEAMS was implemented in 1970, and it provides the Base Civil Engineer with a satisfactory data collection system (14:3). The system serves two primary functions. The first is to satisfy mandatory vertical reporting requirements. The second function is to support the base-level management information requirements (8:14). One limitation of BEAMS is that the "system forces us to manage the past" (43:12) while in reality there exists a need to be able to plan for the future. BEAMS has also altered the perceptions of the users about computers at base-level for the following reasons. The use of BEAMS is restricted due to the limited number and locations of terminals. In addition, the visible system response time is relatively slow (8:14). The result is that the reports that are needed now are available later.

Previously, MAJCOM Engineering and Services information systems were utilized primarily to support HQ USAF

requirements. These systems did not contain the information that the MAJCOM managers needed to function in their day-to-day operations (8:14). The result was that information systems received only minimum attention from MAJCOM personnel. The Air Staff systems were utilized primarily to collect information from each MAJCOM and generate reports to "support Congressional inquiries and required Department of Defense reporting" (8:10). A deficiency with these particular systems was that communication occurred only on a monthly basis, and even though a need existed for two-way communication between the various levels of command, only upward vertical reporting occurred (8:14).

In response to the deficiencies that existed in the Engineering and Services information management systems, an "information requirements study (IRS) was commissioned in Engineering and Services to determine their information needs" (14:2). This two year study which began in 1980 was tasked to evaluate the current situation and to generate recommendations that would meet the future needs of the Air Force. As a result of the IRS, it was determined that a single automated data processing system could not satisfy all base-level, MAJCOM, or Air Staff Engineering and Services information processing needs (8:2). The study also advised that a system was needed which minimized the amount of manual information processing and increased the flow of information throughout the Engineering and Services organizations (B-2).

Engineering and Services Information Management System

Based on the recommendations of the IRS and the recognition of the need for a "state-of-the-art user-friendly Information Management System" (10:1), the Air Force Engineering and Services Center Information Management Systems Office (AFESC/AD) was established. General Wright tasked AFESC/AD with the "total responsibility for planning, programming, and developing the Engineering and Services Information Management System (ESIMS) which includes all automated data processing initiatives at all levels" (10:1). These information system initiatives can be grouped into two primary areas. The first area includes "standard data processing, computer aided design and drafting systems, and time sharing" (14:1). The second area consists of office automation, decision support, and end-user computer initiatives (14:1). WIMS is a major part of the second group of initiatives.

ESIMS is a distributed information management system which is accessible from all levels of commands (8:2). Under the ESIMS concept, a computer system will be provided for Engineering and Services base-level organizations, the MAJCOMs, the AFRCEs, HQ Air Force organizations, technical development centers, and selected schools (8:5). A key factor in the successful management of the Engineering and Services Information Management System is that there must be an integrated approach to the implementation of all of the information system initiatives.

In keeping with this integrated approach and to better manage the large number of systems, each of the Engineering and Services information systems is contained in one or more of the following ESIMS components (14:2).

- Services Information Management System (SVS IMS)
- RED HORSE Information Management System (RHIMS)
- Air Force Regional Civil Engineer Information Management System (AFRCE IMS)
- MAJCOM Engineering and Services Information Management System (MAJCOM/DE IMS)
- HQ AFESC Information Management System (HQ AFESC/IMS)
- HQ USAF Directorate of Engineering and Services Information Management System (AF/LEE IMS)
- Base Maintenance Contract Information Management System (BMC IMS)
- Training Information Management Systems (AFIT, ATC/TTC(s))
- Special Purpose Information Management Systems

Work Information Management System

Although by definition the term WIMS includes the base level system, WIMS will be operationally defined for this study to include only the MAJCOM/DE, HQ AFESC, AF/LEE and AFRCE Information Management Systems. To provide a better understanding of the WIMS system, the history, philosophy, and current status of the Work Information Management System will be reviewed in the following section.

History

Since 1982, the Engineering and Services community has utilized an "early lease" program to develop the Work Information Management System and the Services Information Management Systems (SIMS) (14:2). The leasing of the systems allowed the Air Force to develop 500 customized software applications for the MAJCOM level systems (14:2). These applications were developed by the user for the user. The leasing program provided the Air Force an opportunity to determine the essential characteristics of an effective information management system. These characteristics have been incorporated in the philosophy of WIMS. In preparing for the upcoming implementation of the WIMS hardware, AFESC/AD drafted a Data Project Plan (DPP). The DPP is the official plan and policy for "implementing, managing, and operating WIMS and SIMS throughout the Engineering and Services Community" (15:1). The DPP contains all the objectives, responsibilities, policies, and concepts which AFESC/AD has determined will be necessary for the successful implementation of WIMS. In addition, the DPP describes some of the basic philosophy behind the WIMS systems and some of the factors that AFESC/AD have determined are critical for success.

In order to understand the true difference between WIMS and the previous Air Force information systems such as BEAMS, it is important to briefly discuss the philosophy behind the WIMS system.

Philosophy

The philosophy of WIMS is based on the following ideas (14:4):

- Commitment-Oriented Management
- Accessibility
- Flexibility
- Responsiveness
- Simplicity
- User-Friendly Software

Commitment-oriented management is extremely important in a service organization such as Engineering and Services (14:4). The key idea is that if the organization is capable of tracking previous commitments made then, based on an accurate knowledge of the existing workload, the organization will be able to make realistic commitments to its customers. This concept allows the Engineering and Services organization to develop and maintain credibility with its customers.

The second important component of the WIMS philosophy is accessibility (14:4). Accessibility for the WIMS systems relates to having a high terminal density. A terminal density is the ratio of the number of individuals to each workstation. If an individual cannot find a workstation that is available, he will be forced to either wait until a workstation becomes available or resort to doing the work manually. If the person has to wait too often, the system

will never be truly integrated into the organization. However, if the terminal density is high enough, the workstation becomes an integrated tool that the individual will soon consider indispensable.

Another essential component of the WIMS philosophy is flexibility (14:5). As the work requirements continue to change quickly, the user must be able to develop his own applications and reports using the system utilities. Traditionally with the older Air Force information systems, a request for a new application or report could result in the user waiting for an indefinite period. Even then, there was no guarantee that the report or application would function exactly as the user requested or that the requirements that existed when the request was originally made are the same.

Responsiveness in the WIMS system means that the users will have access to real-time information (14:5). Responsiveness is very integral to commitment-oriented management, and it is very necessary in service organizations. The user must be able to view current information rather than information that is outdated.

Simplicity is one of the key components in the successful implementation of WIMS (14:5). If the system is not simple to operate, the people will not use it. This characteristic will be incorporated into WIMS through the use of menu-driven software. The user will not have to

depend on thick manuals to operate the system. Instead, each program will display a screen with the options that are available and the documentation that is necessary to use the program.

The last component of the WIMS philosophy is user-friendly software (14:6). User-friendly software is software that is easy to learn and easy to use. If the Engineering and Services personnel view WIMS as another task to learn instead of a more efficient way of doing business, they will feel threatened and will offer resistance to the system implementation.

All of these components which make up the WIMS philosophy have been identified through the experiences of the "early lease program". Based on the WIMS philosophy and the lessons learned, AFESC/AD has identified the following factors for success (14:7).

Factors for Success

The most important factor for success is to "prepare and train all users" (14:7). The user should be educated about the benefits of a management information system (MIS). The MIS is intended to be used strictly as a tool, and not as a reason to restructure the organization. The second factor for success is to maintain the focus on the user. If the user does not perceive the information system as being beneficial to him, he will not use it. The third key factor is to avoid changing the person's job within the

organization. Changing a person's job could be perceived as a threat to the individual, and this can lead to increased resistance to the implementation of the system. Another "lesson learned" is to integrate the system throughout the entire organization. This will benefit the organization in several ways. The first benefit is that the amount of information in the system can be reduced, because the organization will be sharing the information instead of having multiple files which contain the same information. The second benefit is that since the information is being shared, the chances are greater that inaccurate information can be corrected more quickly. The end result is that the information will be of a much higher quality level. The final factor for success identified is that, where possible, the people in the organization should not be forced to use the information system. Rather, the decision to use the system must be the individual's and not due to the pressure from upper management. If the system is forced on the people, there is a possibility that a large percentage of people will attempt to resist the system implementation.

The implementation plan developed by AFESC/AD is based on the WIMS philosophy and factors for success that have been discussed. With this as a background, the next section will describe the current status of the WIMS system and the proposed schedule.

Current Status

One of the key milestones in the acquisition of the WIMS and Services Information Management System (SIMS) hardware was the development of the Air Force Minicomputer Multiuser System (AMMUS) contract by AFESC/AD (12:1; 14:1). This competitive contract is scheduled to be awarded in the spring of 1986 (1), and it will result in the acquisition of approximately 250 systems during the next four years. These systems will installed at all levels of the Air Force including the bases, MAJCOMs, AFRCEs, SOAs, and the Air Staff. After the award of the AMMUS contract, AFESC/AD will decide the most effective way to convert the existing WIMS software to operate on the the successful bidder's hardware (12:1).

Currently, the Air Force is reviewing the vendor's proposals and the live test demonstrations are scheduled to be conducted during the summer of 1985 (1). Since the first system will not be installed until the summer of 1986, there is an opportunity for the Air Force to evaluate the degree to which the MAJCOM implementation has succeeded.

Justification

The United States Air Force Engineering and Services organization is preparing to invest $95 million in the implementation of the Work Information Management System. The system will assist the organization in managing its vast resources which include 62,579 personnel, 133,480

facilities, and a federal budget apportionment of almost $6 billion dollars (31:31). General Wright has written several policy letters in the past two years which stressed that the successful implementation of the Work Information Management System is one of the strategic objectives for Air Force Engineering and Services. In compliance with this policy, this study will attempt to evaluate the success of the implementation efforts so far and generate recommendations which can be used to improve the chances that the overall implementation of WIMS will be a success. This is possible because it will be approximately one year till the first system will be installed under the Air Force Minicomputer Multiuser System contract, and there is sufficient time to enhance the AFESC/AD implementation based on the information that will be generated by this study.

The 1984 research by Moschner and Nightengale was a cross-sectional study of the relationship between user attitudes and the perceived success of the Work Information Management System. A cross-sectional study is designed to collect information at a single point in time. One limitation of a cross-sectional study is that when people are asked to report on past events, frequently the people will have difficulty remembering the past unless the events were significant for the individual (17:80). Because the relationship between user attitudes and the success of the Work Information Management System could have changed since

the 1984 study was conducted, the most appropriate research technique to determine if the relationship has changed over time is to to conduct a longitudinal study.

Scope and Limitations

A 1984 AFIT thesis examined the relationship between user attitudes and the perceived success of the Work Information Management System at the MAJCOM, Air Staff and AFRCE Engineering and Services organizations. This current study will replicate the 1984 research and use statistical methods to determine if the Work Information Management System is perceived to be more successful now than in 1984. The questionnaire which was developed for the 1984 study will again be used with the exception that the 1985 survey instrument will have an additional section. This new section will allow the users of the Work Information Management System to provide feedback on the use of WIMS within their organizations.

The survey population will include the same organizations that the 1984 study used. These are the 12 Major Commands, the 5 Air Force Regional Civil Engineer offices, Headquarters Air Force, Headquarters Air Force Reserve, and the Air Force Engineering and Services Center (31:34).

One key limitation to this study is that there is no objective measure such as increase in profits or amount of computer usage which can be used to determine the success of

the Work Information Management System. The strongest measure of success that the Air Force can currently use is the perceptions of the users. Since previous research has supported using the perceptions of users to evaluate the success of an management information system implementation (31), this researcher considers the measurement of users' perceptions a valid method for evaluating the success of the Work Information Management System.

Problem Statement

The 1984 AFIT thesis by Moschner and Nigntengale studied the relationship between user attitudes and the perceived success of the Work Information Management System. Their study statistically indicated that there is a relationship between the perceived success of the system's implementation and the user attitudes. Since the Air Force is waiting until the award of the AMMUS contract to implement the remaining systems, there is a requirement to evaluate the relationship identified by Moschner and Nightengale to determine if there are any additional factors which could increase the probability of a successful WIMS implementation. In addition, it is important to evaluate the users' perceptions of how WIMS has affected the ability of the individual to perform his job.

Research Objectives

This study contains two overall research objectives. The first objective is to study the relationship between user attitudes and the perceived success of the MAJCOM and AFRCE's Work Information Management Systems over time. In addition, this study will attempt to determine if the Work Information Management System is more successful now than it was in 1984. The second research objective is to determine if the implementation of the Work Information System has influenced the ability of the user to perform his job within an organizational setting.

Research Questions

In order to investigate the research objectives, the following research questions were developed.

1. Has the relationship between user attitudes and the perceived success of the Work Information Management System changed over time?

2. Is the Work Information Management System perceived to be more successful in 1985 than it was in 1984.

3. What changes do the users feel are necessary to make the system more successful?

4. To what degree is the Work Information Management System currently being utilized?

5. In what ways do the users of the Work Information Management System feel that their performance has been influenced since the system was implemented?

II. Literature Review

Overview

The objective of this literature review is to provide a framework for studying the relationship between user attitudes and the success of a management information system. In addition, the literature review highlights some of the research that has been done on the impact on organizations due to the implementation of a management information system.

The literature review initially focuses on the role of a management information system within an organizational setting. By using a general definition of "management information system" as a foundation, the review examines how the implementation of a management information system often impacts the organization at both the individual and group level. Research has shown that the implementation of a management information system can either positively or negatively affect the organization depending on the success of the implementation.

The remainder of the literature review focuses on some of the key implementation issues which have been studied in recent years. These issues include: system evaluation and its importance during the life cycle of an information system; a discussion of some of the behavioral factors which affect the success of a management information; and the relationship between user attitudes and the success of a management information system.

Management Information Systems

The term "management information system" is one that many people are familiar with. The term, however, is very abstract and it can mean different things to different people depending on their background and experience. For this reason, there is no single definition which is generally accepted by those working in the field of management information systems (24:33). In order to provide a foundation for this study, the following definition of a management information system will be used, because it contains many of the essential characteristics of a successful management information system.

> A management information system is an organized method of providing past, present and projection information relating to internal operations and external intelligence. It supports the planning, control and operational function of an organization by furnishing uniform information in the proper time-frame to assist the decision-maker. (45:82)

Within any organization, planning and control are two of the most important activities that managers are involved in (2:4). Planning is both deciding what is to be accomplished by the organization and how it will be accomplished (2:4). Control is the process of "assuring that the desired results are obtained" (2:4).

One of the primary objectives of management information systems is to support decision making (27:102). Within an organization, there are three primary types of decisions. These decisions can be classified as either strategic planning decisions, managerial control decisions or

operational control decisions (27:102). The highest level of decision making within an organization is strategic planning. Strategic planning involves formulating the objectives of an organization, changing the objectives as required, and deciding which resources will be used to obtain the objectives (27:102). The second level of decision making can be classified the managerial control. Managerial control is defined as the "process by which managers assure that resources are obtained, and used effectively and efficiently in the accomplishment of the organization's objectives" (27:102). The lowest level of decision making within the organization is operational control. Operational control is primarily concerned with assuring that the specific tasks which are required to achieve the organizational objectives are carried out efficiently and effectively (27:102).

Experience has shown that management information systems have had the greatest impact on the lower level management and routine decisions (27:112; 24:1).

Management Information System's Impact on the Organization

Management information systems, when successfully implemented, can greatly benefit not only the users of the computer system but also the organization as a whole. A study of a corporation by Shank et al found that the implementation of a management information system greatly increased the availability of information throughout the corporation (42:127). This increase in information

supported the management's growing level of confidence for the staff members. In addition, the study indicated that the implementation of the management information system increased not only the productivity of the workers who were already established with the corporation, but it also facilitated the development of productivity in new employees (42:127). Finally, the researchers noted that there was a significant increase in the number of new ideas generated by staff members at all levels.

Foster and Flynn's study of the effect of management information technology on a particular organization noted that the implementation of an integrated information system produced "increases in organizational efficiency, effectiveness, creativity and innovativeness" (18:229). The researchers also reported that the implementation of the management information system fostered an atmosphere within the organization which promoted an increase in personal communication between the members of the organization. The study revealed that the "number of personal contacts within the organization actually increased due to the system implementation" (18:231). An additional benefit of the management information system was that the information was now being distributed at a faster rate, and the quality of the information increased (18:233). In their discussion of the benefits of a management information system, the researchers stated that most organizations will find greater savings by maximizing the effectiveness of the work force,

rather then by using the increase in organizational efficiency to reduce the size of the organization's work force (18:234). The researchers also stressed the fact that not all of the results of the implementation of a management information system are positive. A management information system is strictly a tool to be used by the management (18:235), and it is not a cure for organizational problems. Management information technology "will not make poor organizations function better, but will very likely show that they contain poor performers" (18:235).

The implementation of the management information system can also negatively impact the organization by producing information that is either useless, excessive untimely or very costly (32:24-25).

A benefit of office automation, that is frequently found in "promotional" literature, is that office automation will increase an organization's productivity. This increase in productivity will result from either the same workload being handled by fewer employees, or the same number of employees handling increase levels of work (35:71).

Olson's research focuses on the effect of the new information technology on the different levels of workers. Although Olson feels that the successful implementation of current information technology will "facilitate more flexible, innovative approaches to the organization of work" (35:74), she does not feel that all levels of workers will necessarily experience an increase in productivity. In

particular, Olson states that managers will accept the new office technology only if the they perceive that the technology will be advantageous to them and conform to their style of management (35:80).

Implementation

The implementation of a management information system can be viewed as a "process of social change" (24:199). One effective way of discussing the behavioral and organizational change in an organization is by using the Lewin-Schein Model of change. Using this model, the change within an organization is viewed as a three-stage process (24:199). In order for the change to be effective within an organization, each of the three stages must be completed. Schein defines the three stages in the following way (24:199):

1. Unfreezing: an alteration of the forces acting upon the individual such that his stable equilibrium is disturbed sufficiently to motivate him and make him ready to change; this can be accomplished either by increasing the pressure to change or by reducing some of the threats or resistance to change.

2. Moving: the presentation of a direction of change and the actual process of learning new attitudes.

3. Refreezing: the integration of the changed attitudes into the rest of the personality and/or into ongoing significant emotional relationships.

Traditionally, the implementation process has been viewed as beginning after the definition and design phase and ending after the physical installation of the hardware has been completed and the system is functioning (33:8). In light of

conducting a post implementation evaluation. These strategies for a successful implementation reinforce what many other management information system researchers have expressed as being factors for success. These success factors will be discussed in greater detail in a later section. The literature review will now focus on one of the most neglected and difficult to perform system strategies identified by Multinovich and Vlahovich; the evaluation of the system (33:15).

Evaluation

The evaluation of the implementation process is a necessary step if the management information system is to be determined to be either successful or unsuccessful. Rivard and Huff define evaluation in the following way:

> Evaluation is a set of planned activities undertaken to provide those responsible for the management of the change with a satisfactory assessment of the effects and/or progress of the change effort . . . (36:45)

A key word in their definition is the work "planned". Far too often, the evaluation of a management information system is often neglected or is thought of as a separate activity (36:45). In addition, most management information systems are not systematically evaluated (26:43). Rivard and Huff feel that the evaluation process is an integral part of the implementation process, and that the evaluation process should begin even before the system is designed (36:45).

the organizational change model, the middle stage has been viewed as the system designer's responsibility, and the unfreezing stage and the refreezing stages have been the responsibility of the organization (24:200). Implementation, however, involves all three stages. Some of the organizational forces which are present in the first stage are: top management support for the implementation; a clear felt need by the user for the implementation; and a clearly visible problem (24:200). A study by Sorensen and Sand of 280 management science projects indicates that the three-stage framework has "substantial explanatory power and that the refreezing stage seems most critical in explaining implementation success" (24:201).

Multinovich and Vlahovich (33) have outlined several strategies which they feel will increase the probability of successfully implementing a management information system. These strategies can be classified as either "people related strategies or system related strategies" (33:9-10). The people related strategies include recommendations such as: get management involved; ascertain if there is a felt need for the system; get user involvement; provide training and education; consider user requirements; consider user attitudes; establish effective communication; keep interface simple; and let the management determine information usefulness (33:9-12). The system related strategies include such as ideas as identifying the problem, planning the implementation, controlling the implementation process, and

Keen has developed three requirements for a proper evaluation of a management information system (36:45). The first requirement is that the concept of success must be defined for the particular computer system. The second requirement is that management must allocate both resources and responsibilities to be dedicated for the purpose of system evaluation. The third requirement is that the organization must "develop methods and criteria for evaluation" (36:45).

DeGroff has identified the following three management-type questions which should dominate the implementation evaluation process if the evaluation is to be successful (7:4).

1. Does this organization's information system provide meaningful data for the organization's control, evaluation, and planning process?

2. Is the information timely, accurate, and presented in a form conducive to solving problems and answering questions as they occur in the organization?

3. Does the information improve the overall effectiveness of the organization's operation and does the system create direct or indirect benefits to the citizens? (7:4)

In the evaluation process, DeGroff has identified several important steps which are required for an effective evaluation of a management information system. The first step is to clearly identify those objectives that the management information system was designed to meet (7:4). If the system objectives are not established prior to the

implementation of the system, the results of the evaluation will not be as conclusive as if the objectives had been determined prior to the implementation. The next important step is to evaluate the user's perceptions of information systems (7:5). By evaluating the users' perceptions of information systems, it is possible to collect important implementation information such as the determination of who the users will be, the level of need of the users, the user's value of information and the user's level of expectation (7:5).

The evaluation of a management information system is important throughout the entire life cycle of the system. The life cycle of an information system consists of "the problem awareness and definition stage, the design stage, and the implementation stage" (20:10). Evaluation during the definition and design stage of the system allows important modifications to be made to the system prior to the actual implementation of the system (22:41). Modifications made to the system prior to the actual implementation, versus modifications after the implementation, often result in significant cost savings to the organization During and after the implementation stage, the evaluation process is important in determining whether or not the system is successful in meeting its objectives and whether or not any improvements should be made to the system (22:41).

Chandler divides the evaluation of a management information system into two basic types (4:61). The first type of evaluation focuses on the computer system domain, while the second type of evaluation focuses on the user domain (4:61). "Each has its own goals and measures" (4:61). Common measures of performance for the computer system domain include system cost, resource utilization, and the efficiency of the system. For the user domain, common measures of performance are system reliability and response time.

The fundamental approach to evaluating management information systems has changed in recent years. Initially, information systems were evaluated primarily on the basis of their technical capabilities (28:203). "This emphasis was justified due to the relatively high cost of the early computer systems" (20:10). Based on the behavioral research in management information systems, it has become apparent that the evaluation of only the technical features of a computer system is not sufficient for "consistent success in developing information systems in an organization?" (24:50). It is for this reason that the emphasis for systems evaluation is beginning to focus more on areas such as:

> how well the planning function was carried out; on user involvement; on attitudinal assessments about systems usage; on control or organizational resources; and on the process of development. (20:10)

An example of this change in emphasis is King and Rodriquez's evaluation process model. King and Rodriquez developed a theoretical evaluation process model which assesses the implementation of the system in "terms of attitudes, value perceptions, information usage, and decision performance" (26:43). King and Rodriquez feel that all of these assessment areas are important in the evaluation of a system, but that the attitudes and value perceptions assessment, in particular, are often neglected (26:45).

Factors for Success Relationships

A tremendous amount of management information system research has focused on the identification of those factors which promote the successful implementation of management information systems. Keen and Morton have identified the following five factors which they feel are essential for the successful implementation of a management information system:

1. Top management support
2. A clear felt need by the user
3. An immediate visible problem to work on
4. Early commitment by the user and conscious staff involvement
5. A well-institutionalized MIS group (24:50).

Sander and Courtney's study of organizational factors, which influence the success of an information system, concluded

that top management support, user training, and computer experience are all associated with the successful implementation of a information system (39:77).

Robey identifies user concerns as being a critical factor for the successful implementation of a management information system (37:537). He argues that unless a management information system assists people in the performance of their jobs, the implementation no matter how carefully planned will not succeed (37:537). In addition, Robey states that if a management information system reduces the rewards for the people within the organization, the system is "likely to meet with disaster" (37:537).

There is some controversy as to what degree user involvement is related to the success of a management information system. User involvement refers to the participation of the intended users in the system development process. Ives and Olson state that the "research on user involvement is rarely based on strong theory" (23:587). The researchers feel that conclusions produced by studies about user involvement and the success of a management information system should be reviewed carefully.

It is sometimes difficult to evaluate the success of a management information system using strictly objective measures of success such as economic measures. This is true for several reasons. First, many of the costs and benefits

of a management information system are "difficult to recognize and convert to monetary equivalents" (23:591). In addition, the data on the quality of the system may be obtainable, but frequently the organization does not keep track of this information for the purpose of research (23:591). For this reason, subjective outcome variables have been used to measure the success of the implementation of a management information system. Examples of these subjective measures includes measures such as the perceived quality of the system and system acceptance (23:591-592).

A special case where there is a definite lack of an objective economic success variable is the evaluation of a management information system in a nonprofit organization. Due to the service nature of the organization, the success variable clearly has to be something other than profit-oriented. Anthony and Young state that the goal of a nonprofit organization is to "render as much service as possible with a given amount of resources, or to to use as few resources as possible to render a given amount of services" (2:41). Due to the lack of a profit measure, a nonprofit organization is limited in the following ways (2:42-43):

1. There is no single criterion for making decisions such as a profit measure.
2. There is a difficulty in relating costs and benefits.
3. It is difficult to measure performance in service organizations.

4. There is normally a tendency within nonprofit organizations to centralize decisions.

One point that the research in implementation has recognized is that there is a definite need for a definition of information system success prior to the implementation of the system. Deciding on the appropriate measure of success for a management information system is normally not a simple task. Previous research has utilized many different "success variables". Sands and Courtney's success variables included the users' perceptions of their overall satisfaction with the system and their decision-making satisfaction with the system (39:80). Both of these measures of success are subjective rather than objective. Lucas in many of his behavioral studies has utilized the degree of use of the system by the user as his success variable (37:528). The use of a system can be an appropriate measure of success as long as the use of the system is voluntary. If the use of the system is not voluntary, system usage does not truly reflect a true measure of success for the information system. Ives and Olson discussed the importance of determining the proper indicator of success of a management information system.

> The ideal indicator of success of a computer-based information system is the aggregate organizational benefit accruing for it when compared with alternative investments. The set of measures utilized to determine some aspect of the benefits of a system to the organization is referred to here as measures of system quality. (23:591)

The most common success variable that has been used in the study of the relationship between user involvement and the success of a management information system has been system acceptance (23:592).

User Attitudes and the Success of a Management Information System

A number of studies have evaluated the relationship between the user attitudes and the success of a management information system. It has been shown in past research that "human factors are very significant in the success of information system development" (6:429). In addition,

> Surveys and experiments show that attitudes towards various features of an MIS, system development personnel, and computers in general are related to user behavior. (37:527)

Although most of the research tends to support the theory that user attitudes are related to the success of a management information system, a study by Schewe (1976) concluded that there is no significant relationship between user attitudes and the success of a management information system (37:529) where Schewe defined success as being measured by system usage. In contrast to the findings by Schewe, researchers have determined that user attitudes are related to the success of a management information system. Two researchers that focused their work on the relationship between user attitudes and the success of a management information systems are Schultz and Slevin.

In the mid-1970's, Schultz and Slevin realized that the research on management information system implementation was very limited (40:154), and that there was a need to increase the amount of implementation research. The researchers, in an attempt to stimulate the collection of data on system implementations, devised a Likert-scale instrument which they felt would "provide a meaningful and easily used instrument for data collection" (40:154). The Schultz and Slevin instrument was designed to measure the attitudes of the system users in an attempt to discover which attitudes, if any, were related to the successful implementation of a management information system. The goal of their study was to validate their attitude instrument and to determine the the attitudinal factors associated with the success of a management information system. The approach that Schultz and Slevin used was supported by the research on individual attitude measurement and change which was prevalent at the time (40:155).

Their 100 item questionnaire was pretested by being administered to a sample of 145 MBA students (40:160). After being pretested, the questionnaire was revised to include 67 Likert-scale items (40:160). These Likert items were used to determine which attitudes the system users thought to be significant. The attitudes were the independent variables in their study. The dependent

variables for their study consisted of five questions which measured the users' perceptions of the system's value (40:160). The questionnaire was administered to 106 managers in a large manufacturing company. The researchers performed an orthogonal factor analysis on the responses to the 67 Likert-scale questions they received to determine the important underlying attitudes (40:161). Of the 67 Likert-scale questions which were originally included in the study, "10 were discarded because of low factor loadings or lack of interpretability" (40:163). 57 Likert items were included in the final analysis. As a result of their study, the following seven attitudes were identified (40:174-177):

1. Performance (Factor 1) - The effect on managers' job performance and performance validity.

2. Interpersonal (Factor 2) - Interpersonal relations, communication, and increased interaction and consultation with others.

3. Changes (Factor 3) - Changes will occur in organization structure and people I deal with.

4. Goals (Factor 4) - Goals will be more clear, more congruent to workers, and more achievable.

5. Support/Resistance (Factor 5) - Model has implementation support-adequate top management, technical, and organizational support and does not have undue resistance.

6. Client/Researcher (Factor 6) - Researchers understand management problems and work well with their client.

7. Urgency (Factor 7) - Need for results, even with costs involved; importance to me, boss, top management.

Using regression analysis, Schultz and Slevin determined that there were significant associations between the perceptions of system's value and the users' attitudes of performance (factor 1), goals (factor 4), support/resistance (factor 5) and urgency (factor 7).

One final note about the research performed by Schultz and Slevin is that some researchers feel that they did not strictly distinguish between attitudes and perceptions in their study (37:530). Robey, in an explanation of the methodology used by Schultz and Slevin, felt that it was not necessary for Schultz and Slevin to make such a fine conceptual decision between attitudes and perceptions (37:530) but Robey stated that more emphasis should "be placed on the object of those attitudes than on whether the measure is of a belief, an affective response, or a perception" (37:530).

In addition to the research conducted by Schultz and Slevin, several different researchers have used the Schultz and Slevin instrument to investigate the relationship between user attitudes and behavior (37:531). In 1977, Rodriquez used Schultz and Slevin's instrument to study the effectiveness of different implementation strategies in a laboratory setting (37:531). Rodriquez investigated the relationship between user attitudes and the use of an interactive decision support system. Rodriquez found that

performance (factor 1), goals (factor 4) and urgency (factor 7) were positively related to the "subjects' perceived worth of the system and their actual use of it" (37:531).

Robey and Zeller (1978) conducted a study to determine the reasons why the implementation of a particular management information system was successful in one location and unsuccessful in another location (38:71). The researchers conducted interviews and used Schultz and Slevin's instrument to identify the areas that the system users were most concerned with. Robey and Zeller discovered that the system users, where the management information system was successfully implemented, perceived the attitudes of performance (factor 1) and urgency (factor 7) more favorably than the system users where the implementation of the management information system failed (38:73). Robey and Zeller concluded that at the individual level, certain attitudes are more important in the successful implementation of a management information system than others (38:75). They also emphasized that strong top management support is essential if the management information system is to be adopted by the users (38:75).

Robey and Bakr (1978) used Schultz and Slevin's instrument to investigate how certain user attitudes are related to users' individual differences in work values and with time of exposure to new information technology"

(37:531). Robey and Bakr found that the attitudes of performance (factor 1) and urgency (factor 7), in addition to goals, (factor 4) varied significantly.

Finally in 1979, Robey used Schultz and Slevin's instrument to evaluate the relationship between user attitudes and the use of the management information system and the relationship between user attitudes and the perceived worth of the system. In his study of the relationship between user attitudes and management information system use, Robey found that there was a significant relationship between the use of the system and the attitudes of the users which included: performance (factor 1), goals (factor 4), support/resistance (factor 5), client/researcher (factor 6) and urgency (factor 7) (37:533-534). Robey also discovered that the association between the use of the system and the performance attitude was the strongest (37:533). Using an attachment to the Schultz and Slevin instrument, Robey found that there was also a relationship between attitudes and the perceived worth of the system, but that the attitudes are "less powerful in predicting subjective assessments of perceived worth although the relationships are significant" (37:534). Robey concluded that although there are strong positive relationships between user attitudes and the use of a management information system, it can not be concluded that the attitudes of the users cause the behavior (37:537).

Conclusion

The goal of this literature review was to present a framework for evaluating the relationship between user attitudes and the success of a management information system. The literature review first focused on the definition of a management information system and the ways that a management information system can impact an organization at both the individual and group level. It was shown that the implementation of a management information system can bring about either positive or negative changes to the organization.

The literature review then looked at the concept of implementation as a change process and the need for a systematic evaluation of the implementation. The next area discussed those behavioral factors which research has shown impact the success of a management information system. A critical subject that was identified was the need for a multi-dimensioned definition of success that would include both system and user inputs. It was also shown that this definition of success should be decided upon prior to the implementation of the system.

The final section focused on the research that has been performed on the relationship between user attitudes and the success of a management information system. The primary emphasis was on the attitude instrument developed by Schultz and Slevin. The Schultz and Slevin instrument has been used

repeatedly to determine which areas of the implementation process are of the greatest concern to the user. Specifically, the attitudes relating to job performance, clarity of goals, and sense of urgency have been shown more frequently to be related to the success of a management information system.

The next chapter will focus on the methodology that was used in this study to evaluate the relationship between user attitudes and the success of the Work Information Management System.

III. Research Methodology

Overview

This chapter describes the approach and techniques that were used to answer the research questions which were identified in Chapter I.

In order to answer the first research question, it was necessary to replicate the research performed by Moschner and Nightengale in 1984. To accomplish this objective, the survey questionnaire which was used in the 1984 study was again used. The body of the questionnaire remained unchanged with the exception that a fourth section was added. The fourth section of the questionnaire contained questions which were used to identify additional perceptions of the users about the Work Information Management System. The replication of the 1984 study also served to validate the methodology used in the earlier study. Using the findings from the 1984 study as a baseline, the goal of the first research question was to determine if the relationship between user attitudes and the perceived success of the Work Information Management System has changed over time.

The second research question was answered by evaluating the overall perception of the success of the Work Information Management System in 1985 as compared to 1984 using the two-sample t-test. In addition, an analysis was conducted to determine if the users of the Work Information Management System perceive that changes are necessary in order to make the implementation of WIMS more successful.

The final two research questions were answered by doing a descriptive analysis of the responses to the fourth section of the questionnaire.

This chapter includes a discussion on the research design, a description of the population and the sample size, and a section on the sampling technique that was used in this study. Later sections of the methodology chapter examine the research questionnaire and the validity of each section. Finally, the remainder of the methodology chapter includes an explanation of the statistical analyses that were used and the assumptions that were made.

Research Design

In order to determine if the relationship between user attitudes and the perceived success of the Work Information Management system is changing over time, it was necessary to use a longitudinal design. A longitudinal study is a study that has been repeated over periods of time (17:80). The same respondents may be used in each study, or different people may be used in each study (5:207). One of the key advantages of a longitudinal study over a cross-sectional study is that the changes that occur over time can be evaluated and, in some cases, causality can be determined (17:80). In a longitudinal study, the respondents are generally asked questions about things that are either ongoing or have recently occurred. A critical factor in a valid longitudinal study is that the researchers must be careful to accurately document the methodology used so that

the study may be repeated over different time intervals. If the methodology is not documented correctly, it is not possible to repeat the study without introducing errors which could bias the results to an unknown degree. The methodology for this longitudinal design was based on the methodology used by the Moschner and Nightengale in their 1984 thesis (31). The actual data base which was used for the 1984 research was again used in this study to replicate the findings of Moschner and Nightengale.

Population

The population for this study consisted of all the locations included in the 1984 study. The following organizations were included (31:80-81):

1. Headquarters U.S. Air Force (HQ USAF), Pentagon DC;
2. Headquarters Air Force Reserve (HQ AFRES), Robins AFB GA:
3. Air Force Engineering and Services Center (AFESC), Tyndall AFB FL;
4. Alaskan Air Command (AAC), Elmendorf AFB AK;
5. Air Force Communications Command (AFCC), Scott AFB IL;
6. Air Force Logistics Command (AFLC), Wright-Patterson AFB OH;
7. Air Force Systems Command (AFSC), Andrews AFB MD;
8. Air Training Command (ATC), Randolph AFB TX;
9. Military Airlift Command (MAC), Scott AFB IL;
10. Pacific Air Forces (PACAF), Hickam AFB HI;
11. Strategic Air Command (SAC), Offut AFB NE;

12. Space Command (SPACECOM), Peterson AFB CO;

13. Tactical Air Command (TAC), Langley AFB VA;

14. U.S. Air Forces in Europe (USAFE), Ramstein AB Germany;

15. AFRCE (Ballistic Missile Support), Norton AFB CA;

16. AFRCE (Central Region), Dallas TX;

17. AFRCE (Eastern Region), Atlanta GA;

18. AFRCE (United Kingdom), Ruislip AB U.K.; and

19. AFRCE (Western Region), San Francisco CA.

The population consisted of 2025 WIMS users (31:81). A WIMS user was defined as any individual that has a valid WIMS user identification code and is currently in the organization's WIMS security system. The users of the Work Information Management System include both military and civilians. The military grades range from Second Lieutenant to Colonel for officers and from Airman to Chief Master Sergeant for enlisted. The civilian grades range from GS-3 to GS-14 and from GM-13 to GM-15 (31:81).

The population was divided into 19 subpopulations by location. The size of the subpopulations range from 19 users at the AFRCE (Ballistic Missile Support) to 331 at the Air Force Engineering and Services Center (31:81).

Sample Size

There were several key factors to consider in the determination of the sample size to be used in the study. Two of these factors were based on the statistical tests that were used in the examination of the data (31:82). The

first criteria was the number of cases that were required to perform factor analysis, and the second criteria was the number of cases that were required for multiple regression analysis. An additional criteria to consider was that the sample size selected for the 1985 study should approximate the sample size for the 1984 study so that the error in the statistical tests due to unequal sample sizes would be minimized.

In performing a factor analysis, Comrey uses the criteria that acceptable sample sizes range from 50, which is regarded as poor, to 1000 which is considered excellent (44:379). Other sources say that a "sample size of 50 may even be adequate as long as there are notably more cases than factors" (44:379). Based on a review of the current literature on factor analysis, Moschner and Nightengale concluded that the general rule is that "there should be four or five times as many observations as there are variables to be analyzed" (31:82). The maximum number of variables to be factored in this study was 56. These 56 variables, derived from Schultz and Slevin's instrument, were the questions from the third section of the questionnaire. The resultant sample size based on the requirements for factor analysis was four times the number of variables to be factored, or 224.

The minimum sample size that is recommended for regression analysis is four to five times the number of independent variables that are to used in the regression

analysis (44:86). There will be a maximum of 7 independent variables to consider in the multiple regression analysis. These independent variables are the theoretical 7 attitude factors which were produced from Part III of the questionnaire. The resulting minimum sample size was computed to be 5 times the 7 attitude variables, or 35 cases.

Since the 224 cases was more restrictive then the 35 cases, the minimum sample size for the study was determined to be 224 cases. In order to ensure an adequate response rate, 400 questionnaires were distributed to the various organizations. The number of questionnaires that were distributed in the 1985 study is identical to the number of questionnaires distributed in the 1984 study (31:83). Since the return rate for the 1984 research exceeded 60 percent, it was assumed that the response rate for the 1985 study should be at least sixty percent.

Sampling Technique

A proportionate stratified sampling technique was used to collect the sample. Using this technique, the population was divided into subpopulations, and each of the subpopulations were randomly sampled. There are several distinct advantages to using a proportionate stratified sampling plan (17:167). The first advantage is that the use of this plan will increase the statistical efficiency of the sample. The second advantage is that the probability of adequately representing each subpopulation is increased. The individual organization sample sizes that were used in the former study were again used in this study.

TABLE I

Sample Size Proportion and Sample Size, by Stratum

STRATUM	POPULATION SIZE	RELATIVE WEIGHT	SAMPLE SIZE
AAC	51	0.03	12
AFCC	20	0.01	4
AFLC	117	0.06	24
AFRCE(BMS)	19	0.01	4
AFRCE(CR)	40	0.02	8
AFRCE(ER)	38	0.02	8
AFRCE(UK)	35	0.02	8
AFRCE(WR)	38	0.02	8
AFSC	54	0.03	12
ATC	106	0.05	20
HQ AFESC	331	0.16	64
HQ AFRES	53	0.03	12
HQ USAF	226	0.11	44
MAC	110	0.05	20
PACAF	112	0.05	20
SPACECOM	63	0.03	12
TAC	178	0.09	36
USAFE	227	0.11	44
TOTALS	2,025	1.00	400

Table I which was adapted from the 1984 study (31:85) shows the population size, relative weight, and sample size for each organization. The system administrator provided a current list of the names of all WIMS users in his organization. The users were selected from each organization using a simple random sample. Each system administrator agreed to act as the focal point within his organization. The system administrator at each organization was responsible for distributing the survey packages to the

selected users and collecting all completed surveys. The system administrator then mailed the package of completed surveys back to the researcher. The survey was conducted during the period of June to July 1985.

Research Questionnaire

The attitude questionnaire (Appendix A) used in this study was based on the survey instrument developed by Moschner and Nightengale in their 1984 research (31). As mentioned previously, the questionnaire is identical to the survey used in 1984 with the exception that a fourth section was added. The attitude questionnaire is divided into four parts. Part I contains the questions which record the demographic information of the respondents. The questions include the respondent's location, level of education, amount of computer experience prior to the implementation of WIMS, years of USAF service, and age. The questions were presented as multiple choice questions. Moschner and Nightengale collected this information to determine if any of the demographic variables might be related to either the perceived success of the Work Information Management System or to a particular attitude (31:101). This study did not attempt to replicate this part of the 1984 research because the current research focused on the possible change in the relationship between user attitudes and perceived success and not the relationship between demographic variables and user attitudes or the relationship between demographic

variables and perceived success. The information from Part I of the survey was collected primarily to expand the data base that was established in 1984. This information, however, was not used in the data analysis. Since this section records factual information, validation was not required for this section.

Part II of the questionnaire contains 9 questions which measure the respondent's perceptions of the success of the Work Information Management System. These questions were developed by Moschner and Nightengale based on the Air Force's objectives for the MAJCOM and AFRCE WIMS (31:89). The questions are as follows:

1. How has WIMS changed your productivity?
2. How has WIMS changed your accuracy in decision-making?
3. How has WIMS changed your response time for making decisions?
4. How has WIMS changed the amount of information you use in your decision-making?
5. How has WIMS changed the amount of time you spend in preparing reports?
6. How has WIMS changed the amount of time you spend in reducing (consolidating) data?
7. How has WIMS changed the availability of information that you need to do your job?
8. How has WIMS changed the speed at which you circulate information in your work?
9. How has WIMS succeeded or failed?

The questions are based on a seven-point Likert scale. With the exception of the last question, a response of "1" would indicate least change, a response of "4" would indicate no

change, and a response of "7" would indicate the most change. For the last question in Part II, a response of "1" would represent the greatest degree of failure, a response of "4" would represent no change, and a response of "7" would represent the greatest degree of success. This section of the questionnaire was validated by the successful use of this part of the questionnaire in the 1984 study. In addition, factor analysis was again performed to determine if all of the questions actually measure the underlying variable of the perceived success of WIMS.

Although an objective measure of success would have been desirable, the success measure for this study was subjective since it was based strictly on the perceptions of the users. The use of a subjective success variable is not uncommon in management information system research. Many of the past management information system studies have used subjective variables as their measures of success (23:592; 26:43). Two common subjective variables that have been used are the perceived quality of the system and the degree of system acceptance (23:591-592). In addition, since the Air Force is a nonprofit organization, it is difficult to convert the services it performs to measurable quantities. For these reasons, the use of a subjective measure of success was justified.

The third part of the questionnaire was based on an instrument developed by Schultz and Slevin which measures the attitudes of management information system users.

Schultz and Slevin's instrument consists of 56 statements which describe various aspects of a management information system (40:174-177). In their study, Moschner and Nightengale revised the Schultz and Slevin questionnaire in two respects (31:90). The first revision was that the name WIMS was substituted for the name Forecast. Forecast was the name of the management information system that Schultz and Slevin studied in their research. The second revision was to the tense of the statements. Schultz and Slevin's instrument was written in the future tense. Moschner and Nightengale revised the wording from the future tense to the present tense. The statements in Part III use a "five point Likert-type scale for the responses" (31:90). A response of "1" indicates the strongest possible disagreement with a particular statement. Responses of "3" and "5" represents uncertainty and the strongest possible agreement respectively.

In their study, Schultz and Slevin used factor analysis on the 56 questions to identify seven underlying dimensions of attitudes: individual job performance, interpersonal relations, organizational changes, goal clarity, implementation support, client/researchers relations, and sense of urgency (40:164). Moschner and Nightengale in their 1984 study replicated the work of Schultz and Slevin (31) in producing these factors. This study also performed a factor analysis on Part III of this questionnaire as a part of the replication of the 1984 study and as a further means of validation for this section.

Part IV of the survey was added to the 1984 questionnaire to answer the final two research questions. Questions 72 and 73 asked the respondents for their perceptions of the quantity and quality of the information in their organization's WIMS. Questions 74 and 75 collected information about the amount of time the individual uses WIMS and the percent of time that the individual feels frustrated using WIMS. For questions 72 through 75, the respondents answered the question with a percentage which ranged from Ø - 1ØØ percent. Questions 76 and 77 are open ended questions which investigate the opinions of the respondents on the positive and negative impacts of the implementation of the Work Information Management System in their organization. Question number 78 provided a means for the user of WIMS to provide feedback as to how they feel that the implementation of WIMS could be changed in order to make the system more successful.

The responses from questions 72 through 78 were investigated by examining the range and frequency of the responses given. Their value to the study is to provide additional insight into determining the degree to which the implementation of the Work Information Management System has succeeded or failed.

Statistical Analyses

Statistical analyses were used in this study for the purpose of validating the use of the survey instrument and answering the research questions. The specific statistical

techniques that were performed were factor analysis, reliability analysis, multiple regression analysis and the two-sample t test. In order for these parametric techniques to be used, the assumption must be made that the data is at least interval-level data (31:94; 17:413; 29:146; 30:1-17; 34:6). "Interval-level data assumes an exact knowledge of the differences between the objects being measured" (29:145). The key characteristic of the interval-level scale is that the intervals are of equal distance (17:125; 29:145; 30:1-16). This characteristic allows the addition and subtraction of values (30:1-16).

Currently, there is a debate as to whether or not parametric statistics can be used on ordinal-level data (17:123; 29:146; 34:5). Although statistics developed for a particular level of measurement can always be used with variables at an equal or higher level of measurement (34:5), statistics can not be arbitrarily applied to lower-level variables without careful consideration (34:5). In addition, a controversy exists today as to whether or not attitude surveys can be considered to be interval-level (17:125; 29:146). Since the attitude questionnaire for this study uses Likert-type scales, the data for this study can only be considered ordinal-level (31:94). The use of ordinal-level data only allows the data to be rank ordered, and no determination can be made about the relative distance between the data points (17:122; 29:145).

One opinion that is generally accepted today is that parametric statistics, except for extreme cases, may be used with ordinal-level data (17:125; 29:146).

> Abelson and Tukey argue that the proper assignment of numeric values to the categories of an ordinal scale will allow it to be treated as it were measured at the interval-level. (34:6)

The justification for using parametric statistics in this study was based on the growing acceptance of many researchers to allow the use parametric techniques on ordinal-level data if the data will at least approximate interval-level data (31:94; 29:146).

Factor Analysis

Factor analysis is a collection of statistical techniques used to simplify data analysis by representing a set of manifestation (measurable) variables with a smaller number of latent variables or factors (30:6-12; 25:9; 17:450; 29:149; 34:10). Factor analysis was used in this study to reduce the large number of questions in Parts II and III of the questionnaire to a smaller number of more meaningful variables or factors.

There are three common steps in performing factor analysis. The first step is the preparation of the correlation matrix (34:469). The correlation matrix will indicate the degree of association between the different manifestation variables (25:9,76). The second step in factor analysis is the extraction of the initial factors (34:469; 17:450). "Each of the factors will contribute to

explaining or reproducing the values actually obtained for the manifestation variables to the greatest extent possible" (30:6-4). One common approach to generate the factors is the principle component technique (17:450). This was the method used in this study.

> The principal component technique attempts to define a set of uncorrelated new variables called principal components as linear combinations of the manifestation variables (30:6-71).

The first principal component will be the optimal linear combination of the manifestation variables for explaining the variance in the data (17:450). The succeeding principal components or factors will be the optimal linear combinations for explaining the variance of the data which was not included in previous factors (17:450; 30:6-72). The third step in factor analysis is the rotation of the factors to a terminal solution (34:469). Orthogonal rotation was used in this analysis to achieve the least ambiguous condition between the factors and the variables (31:97; 17:451; 44:399). The rotation is accomplished by "maximizing the variance of the loadings across variables with factors"(44:399). In order to perform the factor analysis, the subprogram FACTOR in the Statistical Package for the Social Sciences (SPSS) (34:468-514) was used. There were several outputs from the FACTOR program which needed to be examined. These were the factor loadings, communalities, and eigenvalues.

The factor loading is the correlation between the factor and the original variables (30:6-25; 31:97). The

value of the factor loading can range from -1.0 to +1.0 (31:97). The absolute value of a factor loading greater than 0.30 is considered significant (30:6-28; C:98). Any variable that did not load at least 0.30 on any factor was eliminated from the study (31:98).

The communality (h^2) is equal to the square of the factor loading for each variable (25:21). "The communality represents the amount of variance in the variable that is explained by the set of factors" (31:98). The value of the communality can range from 0.0 to 1.0, and the minimum value of communalities that were considered significant in this study was 0.25. Variables with communalities less than 0.25 were eliminated from the analysis.

The selection of the maximum number of factors to be retained in the analysis is one of the primary decisions to be made in factor analysis (44:406). There are several accepted methods for determining which factors to retain. The most common "rule of thumb" criteria is to keep all factors with an eigenvalue greater than 1.0 (44:406; 30:6-24). "The eigenvalue represents the amount of total variance explained by each successive factor" (30:6-72).

An alternative method to determine the number of factors to be retained is the scree test (30:6-23; 44:406). The scree test is a graphical procedure which involves plotting the percent of variance (eigenvalues) versus the number of factors (44:406). All the factors, up to and including the factor which begins the scree line, are retained (30:6-24).

A third criteria for determining the number of factors to retain is to examine the total amount of variance explained by the set of factors (31:97). This was the method utilized by Moschner and Nightengale in their study. Their minimum criteria involved accepting a solution which accounts for at least 60 percent of the total variance in the data (31:97). This was also the method used in this study.

Once the factor analysis has been accomplished, it is necessary to perform a reliability analysis on the results of the factor analysis. In this study, the internal consistency method was selected to evaluate the reliability of the factors. "This method assesses the degree to which the questions associated with a particular factor are homogeneous" (31:93). The subprogram RELIABILITY from SPSS (21:248-267) was used to determine the reliability of the instrument. Cronbach's Coefficient Alpha was selected as the measure of reliability. The coefficient's value can range from 0.0 to 1.0 (31:99). A low reliability value indicates that "a substantial portion of the variance in the observed scores is due to measurement error" (31:99). In contrast, a high reliability coefficient indicates that there is a only a small degree of measurement error. Although it is difficult to establish a minimum value for reliability (3:51), a minimum value of 0.7 was used to determine whether or not a factor's reliability was significant.

Multiple Regression Analysis

Multiple regression analysis is a set of statistical techniques used to evaluate the relationship between a dependent variable and several independent variables (44:86; 34:8; 29:163). "The basic goal of multiple regression is to produce a linear combination of independent variables which will correlate highly with the dependent variable" (34:8). Multiple regression techniques were used to accomplish two different objectives. The first objective was to use multiple regression to replicate the analysis by Moschner and Nightengale to determine if their is a significant relationship between user attitudes and the perceived success of WIMS. The second objective, which is more complex than the first, was to determine whether or not the 1984 regression model was equal to the 1985 regression model.

The dependent variable in the regression analysis was the perceived success of the Work Information Management System. This variable was calculated using those variables from Part II of the questionnaire which were determined by factor and reliability analyses to measure the latent variable of the success of WIMS. The actual value of the dependent variable was computed by averaging the responses to the questions selected from Part II.

The independent variables of interest included each of the seven attitude factors which were determined by factor analysis. In the building of the regression model, the goal

of the regression analysis was to limit the number of independent variables so that the "inclusion of an additional independent variable would not significantly increase the accuracy of the model" (29:165).

The NEW REGRESSION subprogram of SPSS (21:94-121) was used to perform the multiple regression analysis. In performing the statistical analysis, the following output from the NEW REGRESSION program was examined:

- Pearson Correlation Coefficient (r)
- Coefficient of determination (R-Squared)
- Change in R-squared
- Standardized Regression Coefficient (beta)
- F-change significance

The Pearson Correlation Coefficient (r) is a measure of the strength of the linear relationship between the dependent variable and any one independent variable (34:276-300)

The coefficient of determination (R-Squared) is a representation of the proportion of the dependent variable's variation explained by the independent variables in the regression model (31:103).

The change in R-squared represents the particular amount of the the variation of the dependent variable explained by the addition of another independent variable in the regression model (34:336).

The standardized regression coefficient (beta) is the "product of the unstandardized regression coefficient and the ratio of the standard deviation of the independent variable to the standard deviation of the dependent variable" (31:104).

"The F-change significance represents the level of significance of the F-ratio test" (31:104). The F-test is used to statistically determine whether or not the "multiple correlation is zero in the population from which the sample was drawn" (34:335).

Assumptions

The following assumptions were made in performing the regression analysis (31:104-105):

1. Each array of values for the dependent variable for a given combination of independent variables follows the normal distribution.
2. The regression line of the dependent variable and the independent variables is linear.
3. All of the arrays of values for the dependent variables have the same variance.
4. The level of data used was at least interval scale.

The SCATTERPLOT option in NEW REGRESSION (21:112-114) was used to examine the residuals to determine if any of the first three assumptions had been violated. A residual value is calculated by taking the difference between the actual value of the dependent variable and the predicted value of the dependent variable generated by the regression model. The residuals were plotted against the predicted value of the dependent variable and the shape of the scatterplot was observed to determine if the assumptions were violated.

Two-Sample t Test

The objective for using the two-sample t test is to determine whether or not there is a significant difference

between two population means (M_is) based on the differences between the sample means (34:267). There are two primary assumptions made when this test is used. The first assumption is that both populations are normally distributed and independent of one another (16:287). The second assumption is that the two population variances are equal but unknown.

Although the population variance is unknown, an estimation of the population variance is computed using the two sample variances and number of cases in each sample. This estimation of population variances is the pooled estimator of the common variance, or S_p^2.

$$S_p^2 = \frac{(m-1)S_1^2 + (n-1)S_2^2}{m + n - 2}$$

where

S_1^2 = the sample variance for group 1

S_2^2 = the sample variance for group 2

m = the number of cases in group 1

n = the number of cases in group 2

The test statistic is

$$T = \frac{\bar{X} - \bar{Y} - d_o}{S_p [(1/m) + (1/n)]^{1/2}}$$

where

$\bar{X}$ = the sample mean for group 1

$\bar{Y}$ = the sample mean for group 2

d_o = the difference between the population means

The null hypothesis is generally that the difference between the population means (M_is) is equal to d_o, or in equation form:

$$Ho: M_1 - M_2 = d_o.$$

The alternative hypothesis can be one of the following three forms:

Alternative 1: Ha: $M_1 - M_2$ is greater than d_o

Alternative 2: Ha: $M_1 - M_2$ is less than d_o

Alternative 3: Ha: $M_1 - M_2$ is not equal to d_o

"The rejection region for the various alternatives uses a t critical value based on a (n + m - 2) degrees of freedom" (16:289).

In this analysis, the level of significance alpha (a) was equal to Ø.Ø5. The two-sample t test was used to determine if the Work Information Management System was perceived to be more successful in 1985 than it was in 1984. The sample means were calculated using the average of the questions in Part II which were used in the analysis to measure the dependent variable (the perceived success of the Work Information Management System). The null hypothesis was that the level of success for the WIMS is the same for both 1984 and 1985. Each of the three alternative hypotheses were explored. The questions which were included in the computation of the perceived success of WIMS were

selected from Part II of the questionnaire after a factor analysis was performed to verify that each of the questions actually measured the underlying variable, "perceived success".

The SPSS subprogram T-TEST (34:267-275) was used to perform the comparison of the sample means.

Summary of Data Analysis

The goal of this chapter was to explain the methodology used in examining the relationship between user attitudes and the perceived success of the Work Information Management System. Various statistical techniques were used to answer the research questions proposed in Chapter I. The first technique, factor analysis, was used to determine both the dependent variable (perceived success) and the independent variables (user attitudes). Reliability analysis was then performed to determine the degree to which the survey questions associated with the attitude factors were homogeneous (31:93). The next statistical technique performed was multiple regression analysis. Multiple regression analysis was used to determine which of the users' attitudes were significantly related to the perceived success of the management information system.

The responses from Part IV, questions 72 through 78 of the survey questionnaire, were analyzed by examining the range and frequency of the responses for each question.

Finally, the last statistical technique that was used in the study was the two-sample t test. The two-sample t

test was used to determine if the Work Information Management System is perceived to be more or less successful now then it was in 1984. The next chapter will report the findings and analysis from this study.

IV. Findings and Analysis

Overview

This chapter describes the survey data that was collected during this study and the analysis of the data used in answering the research questions. In the first part of this chapter, the findings of the study are presented in the sequence that the questions appeared in the survey questionnaire. The remainder of this chapter contains the results of the statistical analysis performed on the data. The statistical techniques used in this study include factor and reliability analysis, regression analysis, correlation analysis and the two-sample t test.

Survey Response Rate

Four hundred survey questionnaires were distributed to the 19 Air Force Engineering and Services organizations which participated in the study. Of the 400 surveys that were distributed, a total of 250 questionnaires were returned, which represents an overall response rate of 62.5 percent. Of those 250 questionnaires returned, 30 questionnaires were non-usable because the respondents failed to complete Part II and/or Part III of the survey. Eleven questionnaires were not completed because the individuals responded that they did not use WIMS. A total of 220 usable questionnaires were collected, which represents an effective return rate of 55 percent.

TABLE II

Comparison of the Number of Questionnaires Distributed and the Number of Usable Responses Received

Organization	Sample Size	Usable Responses Received	Actual Response Rate (%)
Air Force Engineering and Services Center	64	17	27
United States Air Forces in Europe	44	14	32
Headquarters United States Air Force	44	18	41
Strategic Air Command	40	30	75
Tactical Air Command	36	19	53
Air Force Logistics Command	24	22	92
Pacific Air Forces	20	10	50
Military Air Command	20	12	60
Air Training Command	20	11	55
Space Command	12	9	75
Air Force Systems Command Headquarters	12	10	83
Air Force Reserve	12	12	100
Alaskan Air Command	12	3	25
AFRCE (Central Region)	8	8	100
AFRCE (Eastern Region)	8	8	100
AFRCE (Western Region)	8	5	63
AFRCE (United Kingdom)	8	6	75
Air Force Communications Command	4	1	25
AFRCE (Ballistic Missile Support)	4	4	100
Unspecified location		1	
TOTAL	400	220	55

Table II provides the sample size, number of usable responses received and the actual response rate for each of the 19 organizations. There were eight organizations with

very poor to poor response rates, which ranged from 25 to 55 percent. Five organizations had fair to good response rates ranging from 60 to 75 percent. The remaining six organizations had very good to excellent response rates which ranged from 83 to 100 percent. Although 220 cases were available for use in the statistical tests, the actual number of cases for each test varied, because the cases with missing data were deleted listwise. Deleted listwise means that if a case was missing one or more of the data points required for the statistical test, the entire case was deleted for that test.

In Chapter 3, the minimum number of cases required to satisfy the statistical criteria for factor analysis was determined to be 224. Since the minimum response rate was not achieved, the results of the factor analysis were not as significant as if the response rate was at least 224.

The raw data file for the 220 cases used in the statistical analysis is located in Appendix B. The values in the raw data file were recoded to add one unit to each value (i.e., 0=1, 1=2, 2=3, etc) so that the data file would correspond to the responses on the survey questionnaire.

Data Characteristics

Part I of the survey questionnaire (Appendix A) contained the six demographic questions used in the study. Table III through Table VII summarize the survey responses to the questions on users' location, education level, prior computer experience, years of service and age.

TABLE III

Location of Respondents

Location	Frequency		
	Absolute	Relative	Cumulative
Strategic Air Command	30	13.6	13.6
Air Force Logistics Command	22	10.0	23.6
Tactical Air Command	19	8.6	32.2
Headquarters United States Air Force	18	8.2	40.4
Air Force Engineering and Services Center	17	7.7	48.1
United States Air Forces in Europe	14	6.4	54.5
Headquarters Air Force Reserve	12	5.5	60.0
Military Airlift Command	12	5.5	65.5
Air Training Command	11	5.0	70.5
Pacific Air Forces	10	4.5	75.0
Air Force Systems Command	10	4.5	79.5
Space Command	9	4.1	83.6
AFRCE (Central Region)	8	3.6	87.2
AFRCE (Eastern Region)	8	3.6	90.8
AFRCE (United Kingdom)	6	2.7	93.5
AFRCE (Western Region)	5	2.3	95.8
AFRCE (Ballistic Missile Support)	4	1.8	97.6
Alaskan Air Command	3	1.4	99.0
Air Force Communications Command	1	0.5	99.5
Missing Response	1	0.5	100.0
Total	220	100.0	

Location. Table III lists the absolute, relative and cumulative response frequencies for each of the 19 locations. The number of responses for each location range from 1 (0.5 percent) at Air Force Communications Command to

TABLE IV

Education Level of Respondents

Category	Frequency		
	Absolute	Relative	Cumulative
Non-high school graduate	2	0.9	0.9
High school graduate	23	10.5	11.4
Some College, no degree	58	26.4	37.8
Bachelor's degree	83	37.7	75.5
Master's degree	51	23.1	98.6
Doctoral degree	2	0.9	99.5
Missing Response	1	0.5	100.0
Total	220	100.0	

30 at Strategic Air Command (13.6 percent). Ten of the 19 organizations account for 75 percent of the total number of responses. The remaining nine organizations account for only 25 percent of the total number of responses. Only one individual did not indicate the organization he belonged to.

Education Level. Table IV summarizes the various education levels of the respondents. The levels of education are divided into six categories ranging from the non-high school graduate level to the doctoral degree level. Those respondents with educational levels ranging from having some some college to having a master's degree account for over 87 percent of the respondents. Only one respondent failed to indicate his level of education.

TABLE V

Length of Respondent's Computer Experience
Prior to the Implementation of WIMS

Category	Frequency		
	Absolute	Relative	Cumulative
Ø to 6 months	82	37.3	37.3
7 to 12 months	22	10.Ø	47.3
13 to 18 months	11	5.Ø	52.3
19 to 24 months	15	6.8	59.1
25 to 3Ø months	12	5.5	64.6
31 to 36 months	7	3.2	67.8
37 to 42 months	8	3.6	71.4
43 to 48 months	8	3.6	75.Ø
Over 48 months	53	24.1	99.1
Missing Response	2	Ø.9	1ØØ.Ø
Total	22Ø	1ØØ.Ø	

Prior Computer Experience. Table V summarizes the length of computer experience of the respondents prior to the implementation of WIMS. There are nine different categories ranging from Ø to 6 months of computer experience to over 48 months of computer experience. The category with the largest number of respondents is the "Ø to 6 months" group with 82 individuals which represents 37.3 percent of the total number of respondents. The next largest group is the "over 48 months" category with 53 respondents which is 24.1 percent of the total number of respondents. Only two of the respondents failed to indicate their length of experience with computers prior to the implementation of WIMS.

TABLE VI

Respondent's Years of USAF Service

Category	Frequency		
	Absolute	Relative	Cumulative
4 years or less	24	10.9	10.9
5 to 8 years	32	14.5	25.5
9 to 12 years	23	10.5	35.9
13 to 16 years	33	15.0	50.9
17 to 20 years	39	17.7	68.6
21 to 24 years	27	12.3	80.9
25 to 28 years	15	6.8	87.7
29 to 32 years	14	6.4	94.1
Over 32 years	13	5.9	100.0
Total	220	100.0	

Years of Service. In Table VI, the respondents' years of USAF service are grouped into nine different categories ranging from 4 years or less of USAF service to over 32 years of USAF service. The largest group, which consists of 32 individuals, contains the users who have between 5 and 8 years of USAF service. The smallest group was the over 32 years category which had 13 respondents. All respondents completed this question.

Age. Table VII shows the breakdown of the ages of the respondents who participated in the study. The table is broken into 9 categories ranging from the 21 to 25 years of age category to the over 60 years of age category. For the individuals who participated in the study, the average age

TABLE VII

Age of Respondents

Category	Frequency		
	Absolute	Relative	Cumulative
21 to 25 years	12	5.5	5.5
26 to 30 years	20	9.1	14.6
31 to 35 years	36	16.4	31.0
36 to 40 years	48	21.8	52.8
41 to 45 years	32	14.5	67.3
46 to 50 years	30	13.6	80.9
51 to 55 years	18	8.2	89.1
56 to 60 years	10	4.5	93.6
Over 60 years	13	5.9	99.5
Missing Response	1	0.5	100.0
Total	220	100.0	

of the respondents was in the 36 to 40 years of age category. The category with the most users was the 36 to 40 years of age category with 48 responses. The category with the least number of users was the 56 to 60 years of age category with only 10 responses. Only one individual out of the 220 respondents failed to complete this question.

WIMS Success. Part II of the survey questionnaire consisted of nine questions which measured the users' perceptions of the success of WIMS in reaching its objectives. Of the 220 questionnaires returned, only 167 questionnaires were returned with all questions of Part II completed. Table VIII tabulates the mean and standard deviations for the responses to each of the nine questions

TABLE VIII

Data Summary of Responses on WIMS Success

Question No	Question Content	Mean	Standard Deviation
7	Has WIMS changed your productivity?	5.2635	1.2331
8	Has WIMS changed your accuracy in decision-making?	4.9940	1.0326
9	Has WIMS changed your response time for making decisions?	5.0898	1.3746
10	Has WIMS changed the amount of information you use in your decision-making?	5.3593	1.1524
11	Has WIMS changed the amount of time you spend in preparing reports?	3.7365	1.9113
12	Has WIMS changed the amount of time you spend in reducing (consolidating) data?	3.7006	1.8837
13	Has WIMS changed the availability of information that you need to do your job?	5.3593	1.3408
14	Has WIMS changed the speed at which you circulate information in your work?	5.1437	1.3896
15	Has WIMS succeeded or failed?	5.5509	1.1336

in Part II. The mean values range from a low of 3.7006 for question 12 to a high of 5.5509 for question 15. These questions utilized a 7 point Likert-type scale. In completing questions 7 through 14, a response of 4

indicated that there was no change in an individual's ability to perform his job due to WIMS, a response of 1 indicated a large decrease and a response of 7 indicated a large increase. For question number 15, the responses ranged from a response of 1, which indicated that WIMS was perceived to be a large failure, to a response of 7 which indicated that the WIMS was perceived to be a large success. The majority of the five individuals who amplified their response to question 15 felt that, before the success of WIMS could truly be evaluated, the organizations need to receive additional equipment and training. In addition, these five individuals felt that WIMS has only experienced a small to moderate degree of success so far.

User Attitudes toward WIMS. Part III of the survey questionnaire consisted of 56 statements about WIMS and its implementation. Using a 5 point Likert-scale for the range of responses, the answers ranged from 1, which indicated that the individual strongly disagreed with the statement, to 5 which indicated that the individual strongly agreed with the statement. Of the 220 questionnaires returned, only 144 individuals completed all 56 questions in Part III. Table IX lists that mean and standard deviation for each of the 56 statements. The means ranged from a low of 2.3611 to a high of 3.8958. The limited range of mean values indicates that most

TABLE IX

Data Summary of Responses on User Attitudes

Statement No	Statement Content	Mean	Standard Deviation
16	My job is more satisfying	3.3819	0.9752
17	Others can better see the results of my efforts	3.4375	0.9875
18	It is easier to perform my job well	3.5972	1.0599
19	The accuracy of information I receive is improved by WIMS	3.3542	1.0869
20	I have more control over my job	3.2222	1.0340
21	I am able to improve my performance	3.6111	0.9543
22	Others are more aware of what I am doing	3.4236	0.9577
23	The information I receive from WIMS makes my job easier	3.6389	0.9131
24	I spend less time looking for information	3.8060	1.0149
25	I am able to see better the results of my efforts	3.4097	0.9710
26	The accuracy of my work is improved as a result of using WIMS	3.4583	1.0503
27	My performance is more closely monitored	3.0556	1.0363
28	The division/directorate/ section performs better	3.5147	0.8518

TABLE IX (Continued)

Statement No	Statement Content	Mean	Standard Deviation
29	I need to communicate with others more	2.8750	0.9151
30	I need the help of others more	2.6389	0.9506
31	I need to consult others more often before making a decision	2.3611	0.7443
32	I need to talk with other people more	2.5972	0.8716
33	The individuals I work with are changing	2.9097	0.8438
34	The management structure is changing	3.1528	0.9261
35	WIMS does NOT require any changes in division/ directorate/section structure	3.1458	0.9158
36	I have had to get to know several new people	3.0139	1.0172
37	Individuals set higher targets for performance	3.0486	0.8797
38	The use of WIMS increases the Air Force's performance	3.6181	0.8445
39	This project (WIMS) is technically sound	3.7153	0.8744
40	Air Force goals are more clear	3.0556	0.8673
41	My counterparts in other divisions/directorates/ sections identify more with the Air Force's goals	2.9722	0.6991

TABLE IX (Continued)

Statement No	Statement Content	Mean	Standard Deviation
42	The patterns of communication are more simplified	3.2083	0.9303
43	My goals and the Air Force's goals are more similar	3.0972	0.8049
44	The aims of my counterparts in other divisions/ directorates/sections are more easily achieved	3.2500	0.7145
45	My personal goals are better reconciled with the Air Force's goals	3.1389	0.7899
46	Top management provides the resources to implement WIMS	3.3819	0.8928
47	People accept the required changes	3.2708	0.8867
48	Top management sees WIMS as being important	3.9028	0.7127
49	Implementing WIMS is difficult	3.0417	1.0369
50	Top management does not realize how complex this change is	2.7500	0.8731
51	People are given sufficient training to utilize WIMS	2.7917	1.1023
52	This project is important to top management	3.8958	0.7263
53	There is adequate staff available to successfully implement WIMS	2.9583	0.9886

TABLE IX (Continued)

Statement No	Statement Content	Mean	Standard Deviation
54	My counterparts in other divisions/directorates/ sections are generally resistant to changes of this type	2.7153	0.7725
55	Personal conflicts have not increased as a result of WIMS	3.5903	0.7330
56	The developers of WIMS provide adequate training to users	2.7986	0.9335
57	The developers of WIMS do not understand management problems	2.6806	0.7353
58	I enjoy working with those who are implementing WIMS	3.7917	0.6244
59	When I talk to those implementing WIMS, they respect my opinions	3.5903	0.7330
60	WIMS costs too much	2.7083	0.7561
61	I am supported by my boss if I decide not to use WIMS	2.3958	1.0526
62	Decisions based on WIMS are better	3.3264	0.7369
63	The results of WIMS are needed now	3.7083	0.7278
64	WIMS is important to me	3.7778	0.8564
65	I need WIMS	3.7014	0.9318
66	It was important that WIMS be used soon	3.7778	0.6941

TABLE IX (Continued)

Statement No	Statement Content	Mean	Standard Deviation
67	This project is important to my boss	3.7569	Ø.7503
68	WIMS should have been put into use earlier	3.7986	Ø.7896
69	It was urgent that WIMS be implemented early	3.5147	Ø.8761
7Ø	The sooner WIMS was in use the better	3.7292	Ø.7593
71	Benefits outweigh the costs	3.6319	Ø.7999

respondents either slightly disagreed or slightly agreed with the statements about WIMS.

Part IV of the survey questionnaire contained two types of questions. Questions 72 through 75 requested that tne respondents answer these questions by estimating a percentage relating to some aspect of the individuals experience with WIMS. Questions 76 and 77 were open-ended questions which requested information about the respondent's perception of the positive and negative aspects of the WIMS's implementation. Question 78 was an open-ended question which requested the respondent to make recommendations on how to improve the success of WIMS. The responses to the questions from Part IV of the survey questionnaire are tabulated in Table X through Table XVI.

TABLE X

Percent of Job-Essential Information in WIMS

Category	Frequency		
	Absolute	Adjusted	Cumulative
0 percent	10	5.2	5.2
1 to 9 percent	23	12.1	17.3
10 to 19 percent	30	15.7	33.0
20 to 29 percent	24	12.5	45.5
30 to 39 percent	11	5.8	51.3
40 to 49 percent	6	2.6	53.9
50 to 59 percent	24	12.6	66.5
60 to 69 percent	11	5.8	72.3
70 to 79 percent	12	6.2	78.5
80 to 89 percent	14	7.4	85.9
90 to 99 percent	20	10.4	96.3
100 percent	7	3.7	100.0
Missing Response	29		
Total	220	100.0	

Job-Essential Information. In question 72 of the survey questionnaire, the respondent was asked to estimate the percent of information he needed to perform his job which was contained in WIMS. A tabulation of the responses to this question is found in Table X. The minimum value for a response to this question was 0.0 percent which indicated that WIMS does not contain any of the information that the respondent needs to perform his job. The maximum value that was responded to this question was 100.0 percent which indicates that all the information that an individual needs to perform his job can be found in WIMS. Of the 220

TABLE XI

Percent of Accurate Information in WIMS

Category	Frequency		
	Absolute	Adjusted	Cumulative
0 percent	1	0.6	0.6
1 to 9 percent	2	1.1	1.7
10 to 19 percent	2	1.1	2.8
30 to 39 percent	2	1.1	3.9
40 to 49 percent	6	3.3	7.2
50 to 59 percent	12	6.6	13.8
60 to 69 percent	10	5.5	19.3
70 to 79 percent	26	14.4	33.7
80 to 89 percent	26	14.4	48.1
90 to 99 percent	71	39.2	87.3
100 percent	23	12.7	100.0
Missing Response	39		
Total	220	100.0	

questionnaires that were returned, only 191 individuals completed this question. The mean response to this question was 41.2 percent which means that the average respondent perceived that WIMS contains 41.2 percent of the information he needs to perform his job.

Accuracy of Information in WIMS. Question 73 of the survey questionnaire asked the respondent to estimate the percentage of information that he perceived is accurate in WIMS. Table XI contains a summary of the 181 responses that were received. The responses ranged from a minimum value of 0.0 percent to a maximum value of 100.0 percent. A value of 0.0 percent indicated that the respondent perceived that

TABLE XII

Percent of Day Respondents Use WIMS

Category	Frequency		
	Absolute	Adjusted	Cumulative
0 percent	9	4.7	4.7
1 to 9 percent	58	30.0	34.7
10 to 19 percent	48	24.9	59.6
20 to 29 percent	21	10.9	70.5
30 to 39 percent	9	4.6	75.1
40 to 49 percent	6	3.1	78.2
50 to 59 percent	16	8.3	86.5
60 to 69 percent	5	2.6	89.1
70 to 79 percent	8	4.2	93.3
80 to 89 percent	2	1.0	94.3
90 to 99 percent	8	4.1	98.4
100 percent	3	1.6	100.0
Missing Response	27		
Total	220	100.0	

none of the information contained in WIMS is accurate. At the other extreme, a value of 100.0 percent indicated that the respondent perceived that all the information in WIMS is 100 percent accurate. On the average, the respondents felt that 80.1 percent of the information in WIMS is accurate.

Frequency of Use. Table XII summarizes the responses to Question 74 of the survey questionnaire which asked the respondent to estimate the average amount of time each day that he uses WIMS. The values ranged from a low of 0.0 percent to a high of 100.0 percent. Based on the 193 responses to this question that were received, the average user spends 23.7 percent of his day using WIMS. Over 75

TABLE XIII

Percent of Time Respondents Feel Frustrated Using WIMS

Category	Frequency		
	Absolute	Adjusted	Cumulative
0 percent	33	18.4	18.4
1 to 9 percent	47	26.3	44.7
10 to 19 percent	40	22.3	67.0
20 to 29 percent	21	11.7	78.8
30 to 39 percent	9	5.1	83.8
40 to 49 percent	2	1.1	84.9
50 to 59 percent	10	5.6	90.5
60 to 69 percent	1	0.6	91.1
70 to 79 percent	8	4.4	95.5
80 to 89 percent	6	3.4	98.9
100 percent	2	1.1	100.0
Missing Response	41		
Total	220	100.0	

percent of the respondents indicated that, on the average, they spend less than 37 percent of their day using WIMS. Nine individuals responded that they spend 0.0 percent of their day using WIMS. Three individuals responded that they spend 100.0 percent of their day using WIMS.

Percent of Time Frustrated Using WIMS. Question 75 of the survey questionnaire asked the respondent to estimate the average percent of time that he felt frustrated while using WIMS. The values ranged from a low of 0.0 percent to a high of 100.0 percent. On the average, the respondents reported that they felt frustrated using WIMS about 18.2 percent of the time. Of the 220 survey questionnaires that

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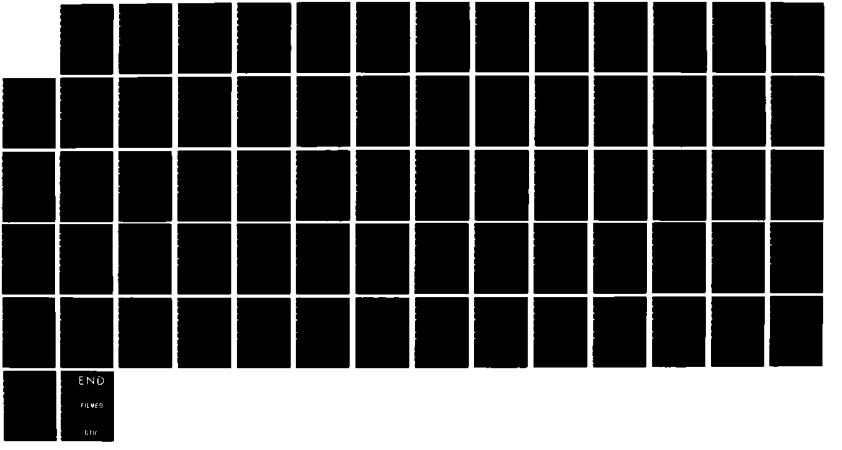

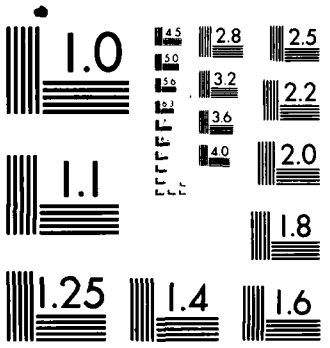

were returned, only 179 individuals completed this question. Over 75 percent of the respondents indicated that they felt frustrated using WIMS less than 25 percent of the time.

Positive Aspects of WIMS Implementation. Question 76 of the survey questionnaire asked the respondent to list three ways in which the implementation of WIMS has positively influenced his ability to perform his job. Table XIV tabulates the responses to this open-ended question. Overall, the responses were broken down into 23 different categories. The frequency of the responses ranged from a high of 59 responses for one category to a low of 1 response for two of the categories. The response most often given was that WIMS has increased the availability of the information within the organization. The second most frequent response given was that WIMS has enhanced the management reports within the organization by improving the quality of the reports and by providing a means to produce them more rapidly. The third most frequent response given was that the implementation of WIMS has simplified the way the respondent performs his job. Of the 220 questionnaires that were returned, 32 individuals did not complete question 76. Eighteen respondents felt that WIMS has had no positive impact on their ability to perform their job.

Negative Aspects of WIMS Implementation. In response to question 77, the participants of the study identified 42 separate areas which they felt were negatively impacted by

TABLE XIV

Positive Aspects of WIMS Implementation

WIMS Contribution	Frequency
Organizational Information is more available. (e.g. faster access to the information)	59
Speed and Quality of the Management Reports.	44
Simplifies Job.	38
Easier to monitor project status and organizational goals and objectives.	30
Increase in the amount of data available (e.g. historical data)	27
Introduction of new technology to the organization (e.g. Word Processing).	25
Enables individuals to work faster.	25
Personal Benefits (e.g. increased job satisfaction, exposure to computers).	22
Information is more accurate.	21
Communication is improved.	21
Saves manhours.	21
Organizational information is more enhanced (more current, less paperwork).	19
WIMS has made no positive contribution to the organization.	18
Increased flexibility in performing job.	14
Better and quicker distribution of information within the organization.	11
Individual's work is more accurate.	10
Better information for decisions.	8

TABLE XIV (Continued)

WIMS Contribution	Frequency
Consolidates work.	8
Access to technical computer programs (e.g. statistical analysis, computations)	8
Data is more visible.	3
Job is more interesting/modernized.	2
Information is more consistent.	1
Less face to face contact required.	1
Missing Response	32

the implementation of WIMS. Question 77 asked the respondents to identify three ways that the implementation of WIMS has negatively affected their organization. The frequency of the responses ranged from a high of 53 to a low of 1. Of the 220 questionnaires that were returned, 185 individuals completed this question. Table XV tabulates the responses to question 77.

The most frequent response to this question was that WIMS has had no negative impact on the organization. The second most frequent response, with only 22 occurrences, was that WIMS has impaired ability of people to perform their job when the system is down. The third most frequent response given was that the implementation of WIMS has created conflict within the organization, particularly between the individuals

TABLE XV

Negative Aspects of WIMS Implementation

WIMS Impact	Frequency
WIMS has had no negative impact on the organization.	53
Lack of work completed during system downtime.	22
Conflict between people in the organization. (e.g. users versus non-users)	17
Failure to realize the potential of system due to a lack of user training.	16
Problems with WIMS software.	14
Lack of confidence in the quality of the information in the system.	14
Shortage of terminals.	12
Takes considerable time for updating.	12
Current computer system is too limited.	11
Increased levels of frustration.	10
Additional workload.	9
Slow response time.	8
Insufficient support from system administrators.	7
Other people should be updating files.	7
Awareness of errors in organization.	7
Information in system is accepted without question.	6
Not enough time available to keep information current.	6

TABLE XV (Continued)

WIMS Impact	Frequency
Too much change in the organization.	1
Previous Air Force system was better.	1
Inability to produce required reports.	1
Individuals procrastinate more.	1
Inability to access information during off-hours.	1
Poor management of the computer system.	1
WIMS's developers were unresponsive to local inputs.	1
People think the system is more than a tool.	1
Missing Response	45

who support using the system and the individuals who are against using the system. Finally, the fourth most frequent response was that the people in the organization failed to realize the potential of WIMS due to a lack of user training.

User Recommendations for Success. The final question in the survey questionnaire, question 78, asked the respondents to make recommendations on how to change WIMS in order to make it more successful. Table XVI summarizes the responses to question 78.

The responses to this question were broken down into 22 separate categories. The frequency of responses within each category ranged from a high of 56 to a low of 1. The

TABLE XV (Continued)

WIMS Impact	Frequency
Duplication of effort (e.g. separate systems must be updated at the same time).	5
Unnecessary information on the system.	5
Data is not accessible for updating.	5
Conflicts about the accuracy of data	4
Performing job takes more time.	4
Excessive money is being spent on WIMS.	3
Individuals are afraid to use the system.	3
Too much staff required for the implementation of WIMS.	3
Inability to input special information/data.	3
System information is not always current.	3
Computer system takes too much space.	3
WIMS's operating system is not compatible with other computer operating systems.	2
Some individuals are not interested in using the system.	2
Waste of paper.	2
System is not being used by top management.	1
System is being used for the wrong purpose.	1
Inability to store store system paper outputs.	1
Failure to communicate system changes to the users.	1
General lack of understanding of the system.	1

TABLE XVI

User Recommendations to Increase the Success of WIMS

Recommendation	Frequency
Increase the quantity and/or the quality of the training for the users.	56
Provide more terminals.	50
Upgrade the hardware of the system to provide additional memory and quicker response time.	26
Allow divisions to have more control over the programs and data they use.	11
WIMS does not require any changes.	20
Provide software that is simpler to use, more powerful and user-friendly.	16
Allocate more manpower for the implementation and the support of the system.	14
Acquire additional software (e.g. graphics, electronic mail, spread sheet)	8
Acquire personal computers which would supplement the mini-computer and provide limited capability when the main computer system is down.	8
Provide more printers.	7
Provide better documentation for the programs in WIMS.	6
Develop programs to increase the quality of the data in the system.	6
Provide better communication for the users about system software and hardware modifications.	5
Provide more top management support.	4
Force individuals to use the system.	4

TABLE XVI (Continued)

Recommendation	Frequency
Implement WIMS at bases now.	4
Do away with BEAMS.	3
Formalize the Information Management Division and its responsibilities within the organization.	3
Limit unnecessary information on the system.	3
Provide/Allow more personal contact.	1
Use the system as designed.	1
Provide furniture that is more suitable with the computer equipment.	1
Missing Response	44

recommendation most frequently given was that WIMS could be more successful if the quantity and/or the quality of the training was increased. The second most frequent recommendation given was that WIMS could be more successful if the number of terminals within the organization was increased. The third most frequent response was that the system hardware should be upgraded to increase the storage capacity of the system and to increase the response time of the system. Of the 220 survey questionnaires returned, 44 individuals did not complete question 78.

Factor Analysis of WIMS Success Questions

Factor analysis was performed on the nine success questions in Part II of the survey questionnaire. The goal of the factor analysis was to reduce the nine questions to one "success factor" which would be the dependent variable used in the regression analysis. After performing the initial factor analysis, two distinct factors were identified. Table XVII summarizes the communalities and factor loadings from the first iteration of the factor analysis. Questions 7, 8, 9, 10, 11, 14 and 15 loaded significantly on factor 1, and questions 11 and 12 loaded significantly on factor 2. Since the objective of the factor analysis was to identify a single success factor, the researcher decided to use only factor 1 in the regression analysis since the content of the questions in factor 1 most nearly described the overall success of WIMS. Moreover, the content of questions 11 and 12 in factor 2 focused more on the time dimension than on the overall success of WIMS.

The factor analysis was again performed using only questions 7, 8, 9, 10, 13, 14 and 15. The results from the final iteration of the factor analysis are tabulated in Table XVIII. The final success factor, although it met the criteria for communalities greater than or equal to 0.25 and for factor loadings greater than or equal to 0.30, did not meet the criteria of explaining at least 60 percent of the variance of the data. Since the success factor in this study only described 55.4 percent of the variance in the

TABLE XVII

First Iteration Communalities and Factor Loadings for WIMS Success Questions

Question No	Question Content	Commun -ality	Factor 1 Loading	Factor 2 Loading
7	Has WIMS changed your productivity?	0.6666	0.8162	-0.0183
8	Has WIMS changed your accuracy in decision-making?	0.5780	0.7602	-0.0122
9	Has WIMS changed your response time for making decisions?	0.4244	0.6508	0.0299
10	Has WIMS changed the amount of information you use in your decision-making?	0.5412	0.7343	-0.0454
11	Has WIMS changed the amount of time you spend in preparing reports?	0.8838	-0.0549	0.9385
12	Has WIMS changed the amount of time you spend in reducing (consolidating) data?	0.6330	-0.0053	0.7956
13	Has WIMS changed the availability of information that you need to do your job?	0.3776	0.6143	0.0162
14	Has WIMS changed the speed at which you circulate information in your work?	0.4368	0.6608	0.0132
15	Has WIMS succeeded or failed?	0.3469	0.5754	-0.1256

TABLE XVIII

Final Communalities and Factor Loadings
for WIMS Success Questions

Question No	Question Content	Communality	Factor Loading
7	Has WIMS changed your productivity?	0.65319	0.80820
8	Has WIMS changed your accuracy in decision-making?	0.57921	0.76106
9	Has WIMS changed your response time for making decisions?	0.41160	0.64156
10	Has WIMS changed the amount of information you use in your decision-making?	0.55302	0.74365
13	Has WIMS changed the availability of information that you need to do your job?	0.40090	0.63316
14	Has WIMS changed the speed at which you circulate information in your work?	0.43854	0.66222
15	Has WIMS succeeded or failed?	0.34482	0.58721

data, the conclusion based on the results of the regression analysis must be evaluated in light of this weakness. The final factor solution contained the one success factor comprised of questions 7, 8, 9, 10, 11, 14 and 15. Of the 220 usable cases available, the factor analysis used 175

cases in generating the success factor which was used as the the dependent variable in the regression analysis.

Reliability of the WIMS Success Factor. The SPSS subprogram RELIABILITY was used to calculate the reliability coefficient for the success factor. The Cronbach's Coefficient Alpha for the success factor was calculated to be 0.84258 which indicates that the factor is a reliable scale and that the questions within the factor are consistent.

Factor Analysis of User Attitudes Statements

The questions in Part III of the survey questionnaire are statements which measured various user attitudes about WIMS. Factor analysis was used to reduce the 56 statements, questions 16 to 71, to a smaller number of attitude factors. The attitude factors were used in the regression analysis as the independent variables. Factor analysis was performed several times on the attitude questions from Part III before the final factor solution was determined. Each time the factor analysis was performed, a question was eliminated from the list of variables if it did not meet the minimum criteria for factor analysis identified in Chapter III. The criteria used was that a question was eliminated from the factor solution if either the communality for that question was less than 0.25, or the question did not load at least 0.30 on any of the factors.

In the first iteration of the factor analysis, question 35 was eliminated because its communality, which was equal

to Ø.18555, was less than the minimum acceptable value of Ø.25. Similarly, questions 46 and 5Ø, with communalities of Ø.24713 and Ø.21776 respectively, were eliminated because their communalities were below the minimum acceptable value. Question 54 was eliminated because its communality was Ø.14967, and because it did not load at least Ø.3Ø on any factor. Finally, question 61 was eliminated because its communality was equal to Ø.12414, and it did not load significantly (greater than Ø.3Ø) on any one factor. Appendix C shows the communalities and the factor loadings for each of the questions after the first iteration.

After the second iteration of the factor analysis, questions 53 and 55 were eliminated because their communalities were below the minimum acceptable value of Ø.25. Question 53 had a communality of Ø.19613, and question 55 had a communality of Ø.23778. Appendix D contains the communalities and factor loadings which were generated after the second iteration.

After the third iteration, question 6Ø was eliminated because its communality was equal to Ø.23585 which was less than the minimum acceptable value. Appendix E shows the communalities and the factor loadings after the third iteration. After question 6Ø was eliminated from the list of variables in the analysis, the final factor analysis was performed. The final factor solution, consisting of seven factors, was generated using 147 of the 22Ø usable cases.

The seven factors accounted for 61.8 percent of the variance of the 48 questions that were factor analyzed. All of the factor loadings and communalities exceeded the minimum criteria of 0.30 for factor loadings and 0.25 for communalities. Appendix F contains contains the communalities and the factor loadings for the final factor solution.

The labeling of the factors followed the technique used by Moschner and Nightengale in their study (31:126). The naming of the factors was accomplished by ranking each of the statements for each factor in descending order based on the factor loadings. The label for each factor was determined by considering the content of each of the statements within a given factor. The seven factors were labeled as follows:

Factor 1 - job performance,

Factor 2 - sense of urgency,

Factor 3 - organizational changes/clarity of goals,

Factor 4 - interpersonal relations,

Factor 5 - implementation support/resistance,

Factor 6 - importance to top management and

Factor 7 - client researcher relations.

The factor labels selected were identical to the ones that Moschner and Nightengale used in their study (31:126). In the following section, each of the factors will be evaluated

in terms of the statements which comprise the factors and their respective factor loadings.

Job Performance (Factor 1). Factor 1 consisted of 18 attitude statements and it accounted for 55.9 percent of the variance of the data. The factor loadings ranged from a high of 0.801 to a low of 0.304. The majority of the statements respect some aspect of job performance. The following are the attitude statements and respective loading which comprised factor 1 - job performance.

Loading	Number	Statement
0.801	18	It is easier to perform my job well.
0.781	25	I am able to see better the results of my efforts.
0.779	26	The accuracy of my work is improved as a result of using WIMS.
0.758	21	I am able to improve my performance.
0.756	16	My job is more satisfying.
0.719	20	I have more control over my job.
0.702	23	The information I receive from WIMS makes my job easier.
0.698	19	The accuracy of information I receive is improved by WIMS.
0.691	17	Others can better see the results of my efforts.
0.691	24	I spend less time looking for information.
0.611	22	Others are more aware of what I am doing.
0.589	38	The use of WIMS increases the Air Force's performance.

0.469	62	Decisions based on WIMS are better.
0.466	37	Individuals set higher targets for performance.
0.456	42	The patterns of communication are more simplified.
0.439	39	This project (WIMS) is technically sound.
0.428	28	The division/directorate/section performs better.
0.304	36	I have had to get to know several new people.

With the exceptions of statements 36, 39, 42 and 62, all of statements in factor 1 directly describe some aspect of job performance. The remaining questions were either indirectly related to job performance or their low factor loadings, as compared to the other statements, reduced their impact in determining a label for the factor 1.

Sense of Urgency (Factor 2). Factor 2 accounted for 12.0 percent of the variance of the data, and it consisted of nine attitude statements. The factor loadings ranged from a high of 0.775 for statement 70 to a low of 0.436 for statement 67. The content of all of the statements in factor 2 described in some way the user's attitude of how urgent it was to implement WIMS. The statements and factor loadings for factor 2 were the following:

Loading	Number	Statement
0.775	70	The sooner WIMS was in use the better.
0.759	68	WIMS should have been put into use earlier.

0.751	66	It was important that WIMS be used soon.
0.720	65	I need WIMS.
0.708	64	WIMS is important to me.
0.683	69	It was urgent that WIMS be implemented early.
0.640	63	The results of WIMS are needed now.
0.619	71	Benefits outweigh the costs.
0.436	67	This project is important to my boss.

Organizational Changes/Clarity of Goals (Factor 3). The third factor labeled "organizational changes/clarity of goals" accounted for 10.3 percent of the variance in the data. The factor is a composite of 7 attitude statements that reflect how WIMS has facilitated change within the organization, with particular emphasis on the users' goals and the users' perceptions of the organizational goals. The factor loadings ranged from a high of 0.621 for statement 41 to a low 0.398 for statement 34. The following statements and their respective factor loadings comprised factor 3.

Loading	Number	Statement
0.621	41	My counterparts in other divisions/directorates/ sections identify more with the Air Force's goals.
0.562	43	My goals and the Air Force's goals are more similar.
0.512	40	Air Force goals are more clear.
0.509	44	The aims of my counterparts in other divisions/directorates/sections are more easily achieved.

0.505	45	My personal goals are better reconciled with the Air Force's goals.
0.491	33	The individuals I work with are changing.
0.398	34	The management structure is changing.

Interpersonal Relations (Factor 4). The fourth factor, interpersonal relations, explained 8.0 percent of the variation of the data. The content of the four statements which comprised factor four describe how WIMS has impacted the personal needs of individuals within the organization. The statements and factor loadings for factor 4 were as follows:

Loading	Number	Statement
0.803	32	I need to talk with other people more.
0.751	30	I need the help of others more.
0.746	31	I need to consult others more often before making a decision.
0.732	29	I need to communicate with others more.

Implementation Support/Resistance (Factor 5). The fifth factor that was generated through the factor analysis was the "implementation support/resistance" factor. The content of the attitude statements which comprised this factor is concerned with the user perceptions of the implementation process. The "implementation support/resistance" factor explains 5.5 percent of the

variance of the data and it consists of the following four attitude statements and their respective factor loadings.

Loading	Number	Statement
0.767	51	People are given sufficient training to utilize WIMS.
0.639	56	The developers of WIMS provide adequate training. to users
-0.524	49	Implementing WIMS is difficult.
0.449	47	People accept the required changes.

Importance to Top Management (Factor 6). The content of the three statements which make up the sixth factor, "importance to top management", were primarily concerned with the users' perception of how important the implementation of WIMS was to top management. The sixth factor explained an additional 4.3 percent of the variance in the data, and it consisted of the following attitude statements and their respective loadings.

Loading	Number	Statement
0.770	52	This project is important to top management.
0.665	48	Top management sees WIMS as being important.
0.326	27	My performance is more closely monitored.

Client Researcher Relations (Factor 7). Factor 7, "client researcher relations", consisted of 3 attitude statements and it explained the final 3.9 percent of the

variance in the data. The factor describes the users' perception of the relationship between the implementators of WIMS and the users of the system.

Loading	Number	Statement
0.638	58	I enjoy working with those who are implementing WIMS.
0.534	59	When I talk to those implementing WIMS, they respect my opinions.
-0.340	57	The developers of WIMS do not understand management problems.

Reliability of the Attitude Factors. The SPSS subprogram RELIABILITY was used to calculate Cronbach's Coefficient Alpha, the reliability measure, for each of the seven attitude factors. Table XIX summarizes the results of the reliability analysis. In Chapter III, the minimum significant value for reliability was determined to be 0.70. With the exception of factor 5 (implementation support/resistance) and factor 6 (importance to top management), the reliability of each of the attitude factors was substantiated. When a factor is unreliable, it indicates that the statements which comprise the factor are not consistent (31:133). Factor 5 is not reliable since its Cronbach's Coefficient Alpha is equal to 0.67 which is less than the minimum acceptable value of 0.70. Similarly, factor 6 is not reliable because the value of the Cronbach's Coefficient Alpha for factor 6 was calculated to be 0.61.

TABLE XIX

Reliability Coefficients for Attitude Factors

	Factor	Cronbach's Coefficient Alpha
1.	Job Performance	Ø.95
2.	Sense of Urgency	Ø.92
3.	Organizational Changes/ Clarity of Goals	Ø.82
4.	Interpersonal Relations	Ø.85
5.	Implementation Support/Resistance	Ø.67
6.	Importance to Top Management	Ø.61
7.	Client/Researcher Relations	Ø.70

which is also less than Ø.70. Since factors 5 and 6 collectively explain only 9.8 percent of the variance in the data, all 7 factors will still be used in the regression analysis. The results of the regression analysis, however, must be evaluated more carefully since not all of the independent variables in the model were determined to be reliable.

Validity of Questionnaire. In comparing the results of the factor analysis of the 1984 study with the 1985 study, the final factor solutions varied slightly. For the success factor, the 1984 factor analysis of the questions in Part II of the survey eliminated question 9 because its communality

was equal to 0.2165 (31:122) which was less than the minimum acceptable value of 0.25. In the current study, however, question 9 was retained in the final factor solution. In addition, while the success factor for the 1984 study explained 61.5 percent (31:123) of the variance of the questions used in the factor analysis, the success factor for the current study explained only 55.4 percent of the variance in the question. The current study failed to meet the minimum criteria of the factor solution explaining at least 60 percent of the variance which was established by the 1984 study.

In the factor analysis of the attitude statements, both the 1984 study and the current study resulted in the naming of the same factors, but the final factor solutions varied slightly. For factor 1 (job performance), the current study deleted statement 27 from the final factor solution because statement 27 loaded slightly more heavily on factor 6 than it did on factor 1. In addition, the current study included statements 36 and 39 in factor 1 while the 1984 study did not.

For factor 2 (sense of urgency), the composition of the factor differed in several ways. First, statement 67 loaded significantly on factor 2 in the current study while in the previous study it did not. In addition, the current study deleted statements 39 and 60 from its final factor solution while the 1984 study included statements 39 and 60.

For the third factor (organizational changes/clarity of goals), there was no difference between the 1984 and this study. Similarly for the "interpersonal relations" factor, both studies resulted in the same statements loading significantly.

For the "implementation support/resistance" factor, the current study differs in that statements 46, 50 and 53 were deleted. In the "importance to top management" factor, the current study deleted statement 67 and added statement 27. Finally, for the "client researcher relations" factor, the current study contained statement 57 while the 1984 study did not.

The 1984 factor solution explained 60.0 percent of the variance in the attitude statements. The current study yielded a factor solution which explained 61.8 of the variance in the attitude statements.

Although there are some differences between the two studies, considering the similarity of the results of the final factor solution, the survey questionnaire is considered valid. The differences could have partially resulted from the differences in the sample sizes of the two studies. Although the required sample size to perform factor analysis on the attitude statements was determined to be 224, the current study used only 147 cases in the final factor solution. This resulted from a lower response rate.

TABLE XX

Stepwise Regression of Attitude Factors as Predictors of WIMS Success

Step	Independent Variable	r	Beta	R-Squared	Change in R-Squared
1	Job Performance	Ø.71557	Ø.71557	Ø.5Ø78Ø	Ø.5Ø78Ø
2	Sense of Urgency	Ø.58769	Ø.21Ø41	Ø.52935	Ø.Ø2543
				Total R-Squared =	Ø.52935

Regression Analysis of WIMS Success vs Attitudes

In order to determine if any of the attitude factors were significant predictors of WIMS success, a stepwise regression analysis was performed. Table XX summarizes the significant results of the stepwise regression analysis between the dependent "success" variable and the 7 independent "attitude" variables. As shown in Table XX, only two of the seven attitude factors entered the regression model at the Ø.95 level of significance. These variables were "job performance" and sense of urgency.

The first variable to enter the regression model was the "job performance" variable. "Job Performance" explains almost 51 percent of the variance in the dependent variable. In addition, "job performance" and WIMS success are positively related.

The second variable to enter the regression model was the "sense of urgency" variable. With the "job performance" variable already in the regression model, the "sense of urgency" variable explains an additional 2.5 percent of the variance in the success variable. In addition, the "sense of urgency variable" also is positively related with WIMS' success variable.

Residual Analysis. In order to test the regression assumptions made in Chapter III, the residuals were examined using the SCATTERPLOT option of the the SPSS subprogram NEW REGRESSION. Since the scatterplot failed to display a definite pattern which would indicate a violation of one or more of the assumptions, the regression assumptions were determined to be valid.

Two-Sample t Test

Using the dependent "success variable" from the 1984 study as the measure of success for WIMS, a two-sample t test was performed to determine if WIMS was perceived to be more successful in 1985 than it was in 1984. The "success variable" consisted of the mean of the responses to questions 7, 8, 10, 11, 14 and 15 from Part II of the survey questionnaire. Based on a F Value of 1.10, a 2-tail probability of 0.509 and a level of significance of .05, the variances for the two groups were determined to be equal, and the two-sample t test with the pooled estimator of the common variance was used. Table XXI summarizes the results of the two-sample t test. The null hypothesis was that the

TABLE XXI

Two-Sample T Test Results

Year of Study	Number of Cases	Mean Value	T-Value	Degrees of Freedom	1-Tail Probability
1984	222	5.0398			
			2.77	397	0.003
1985	177	5.3013			

success of WIMS in 1985 is less than or equal to the success of WIMS in 1984. The alternative hypothesis was that WIMS is perceived to be more successful in 1985 than it was in 1984. From the 1984 study, 222 cases were included in computing the mean success value. From the current study, 177 cases were used. Although a mean value of between "5" and "6" for the success variable indicates that WIMS is perceived to be only slightly to moderately successful, the difference in the mean values for the two years is statistically significant at the .003 level of significance.

Summary

The statistical analyses of this chapter accomplished two primary objectives. First, it validated the research conducted by Moschner and Nightengale in their 1984 study. Second, the statistical analyses provided answers to the five research questions.

Following their methodology, factor analysis was performed on the data from Part II of the survey questionnaire to develop the dependent "success" variable used in the regression analysis. Factor analysis was also performed on the attitudinal data from Part III of the survey questionnaire to generate the seven independent attitude variables. Multiple regression analysis was performed to determine if there is a relationship between user attitudes and the perceived success of WIMS. As with the 1984 study, positive relationships were found between the perceived success of WIMS and the user attitude of "job performance" and between the perceived success of WIMS and the user attitude of "sense of urgency". Because the composition of the dependent and independent variables were not identical in both the 1984 and 1985 studies, it was not possible to determine statistically whether or not the relationship between user attitudes and perceived success has changed over time. The differences in the results of the factor analysis between the two studies were due primarily to the low response rate of the 1985 study. It was for this reason that the first research question could not be answered.

To answer the second research question, statistical analyses was used to determine whether or not WIMS is perceived to more successful in 1985 than it was in 1984. Using the two-sample t test, it was statistically determined that the users perceive WIMS to be more successful in 1985 than it was in 1984.

The responses to Part IV of the survey questionnaire were analyzed to answer the final three research questions. In response to the third research question, the majority of the respondents felt that WIMS could be more successful by providing more terminals and by increasing the quantity and the quality of the users' training.

The users' perceptions of the time they use the system, the quality and quantity of job-related information in the system, and their level of frustration were evaluated to answer the fourth research question. On the average, the respondents felt that WIMS contains 41.2 percent of the information they need to perform their job and that the information in WIMS is 80.1 percent accurate. In addition, the average respondent spends 23.7 percent of his day using WIMS, and he feels frustrated 18.2 percent of the time.

To answer the final research question, a descriptive analysis was performed on the users' perceptions of how the implementation of WIMS has positively and negatively impacted their organization. The most frequent response to the way that WIMS has contributed positively to the organization was that organizational information is now more available, and the most frequent response to the way that WIMS has negatively impacted the organization was that WIMS has had no negative impact.

V. Conclusions and Recommendations

Summary of Research

The Air Force is preparing to invest $95 million in the implementation of the Work Information Management System (WIMS). If successful, the implementation of WIMS will provide the Air Force Engineering and Services' community with a tool to better manage the 62,759 personnel, 133,480 facilities and $6 billion budget (31:31) that it is responsible for. WIMS can only be successful if it is accepted and used by the individuals for whom it was designed.

In 1984, AFIT researchers determined that there is a significant relationship between user attitudes and the perceived success of WIMS. Specifically, the researchers found that the user attitudes of "job performance" and "sense of urgency" were significant predictors of the perceived success of WIMS. These researchers recommended that a longitudinal study be performed to determine if the relationship between user attitudes and the success of WIMS changes over time. This current research is a continuation of the 1984 study.

In Chapter I, the research objectives and the research questions for this study were identified. There were two primary research objectives in this study. The first research objective was to determine if the relationship between user attitudes and the perceived success of WIMS has

changed over time. The second research objective was to determine what impact the implementation of WIMS has had on the 19 Air Force Engineering and Services organizations that have been using WIMS for the past year. In addition, this study also sought to evaluate the degree to which WIMS is currently being utilized and to determine strategies which could potentially increase the overall success of WIMS.

The second chapter then presented a review of the literature on management information systems, the impact of management information systems on the organization and the importance of evaluation in the implementation process. It was shown that a management information system is a tool to be used by management, and that the implementation of the management information system can produce both positive and negative results within the organization. The literature review concluded with a discussion of the research on the "factors for the success" relationships. The "factors for success" relationship that this study is based upon is the relationship between user attitudes and the success of a management information system. It was also in this latter portion of Chapter II that the studies that have used Schultz and Slevin's attitude survey were summarized. Part III of the survey instrument that was used in this research was based on the Schultz and Slevin instrument.

Chapter III described the methodology that was used to explore the research objectives. Four hundred survey

questionnaires were distributed to the same 19 Air Force Engineering and Services organizations which participated in the 1984 study. The survey questionnaire consisted of four parts. Part I was primarily concerned with demographic information. Part II of the survey questionnaire consisted of nine questions which focused on different aspects of the success of WIMS. The third part of the questionnaire, which was based on the Schultz and Slevin's instrument, consisted of 56 attitude statements which describe various aspects of WIMS. The final part of the survey questionnaire consisted of seven questions which were used to collect additional information about the users' perceptions of WIMS.

Of the 400 surveys that were distributed, only 220 usable surveys were returned. This represents an effective response rate of 55 percent. Factor analysis was performed on the survey responses and the same basic success and attitude factors, as the 1984 study, were produced. The nine success variables were reduced to one success factor, and the 56 attitude statements were reduced to 7 attitude factors. The differences in the variables which comprise the individual factors between the two studies can be attributed primarily to the low response rate of the current research. Regression analysis was then performed using the success factor as the dependent variable and the attitude factors as the independent variables. As with the 1984 study, the "job performance" attitude and the "sense of

urgency" attitude each proved to be a significant predictor of the perceived success of WIMS. These results indicate that those users, who feel that WIMS significantly affected their job performance and/or feel an urgent need that WIMS be implemented, generally experience a higher level of success with WIMS than those users who do not possess these attitudes. Collectively, the regression model explained 52.9 percent of the variance of the success variable. Although the 1984 regression model explained more of the variance of the success variable, it was not possible to compare the two regression models, because the composition of both the dependent success variable and the seven attitude variables were not identical in the two studies.

Using the two-sample t test to compare the success of WIMS between 1984 and 1985, it was determined that WIMS is significantly more successful in 1985 than it was in 1984.

The final statistical analysis was performed on the responses to Part IV of the survey questionnaire. Simple descriptive statistics, which includes computation of the frequency, range and mean value, were performed on questions 72 through 75. These results were used to evaluate the users' perception of how much they use the system, the quantity and the quality of the job-related information in the system, their level of frustration when they use the system. The responses to these questions all ranged from 0.0 to 100.0 percent. On the average, the users responded

that WIMS contains 41.2 percent of the information they need to perform their jobs, and that the information is 80.1 percent accurate. In addition, the average user responded that he spends 23.7 percent of his day using WIMS, and he feels frustrated 18.2 percent of the time.

The responses to questions 76 and 77 were examined to determine how WIMS has positively and negatively affected the organization. Question 76 asked the respondent to list three ways that the implementation of WIMS has positively influenced his ability to perform his job. Of the 220 usable surveys that were returned, 188 individuals answered question 76. The responses to question 76 were divided into 23 categories. The most frequent response was that organizational information is more available. The second most frequent response was that WIMS has positively contributed through the speed and quality of the management reports that are now available. Only 18 individuals responded that the implementation of WIMS has had no positive benefits.

Question 77 asked the respondent to list three ways that WIMS has negatively affected his organization. Of the 220 usable responses, only 185 individuals completed question 77. The responses to question 77 were divided into 42 categories, which is almost twice the number of categories for the positive responses. This indicates that the respondents perceptions of the negative aspects of WIMS

are less defined than the respondents perceptions of the positive aspects of WIMS. In addition, the most frequent response to question 77 was that WIMS has had no negative impact on the organization. Only 22 individuals gave the response that the ability of people to perform their job is impaired when the system is not operating. This was the second most frequent response. Based on the responses to both questions 76 and 77, it is apparent that the users overall impression is that the implementation of WIMS was more positive than negative.

Finally in response to question 78, the users identified 22 ways that they felt that the success of WIMS could be increased. The most frequent response was that WIMS would be more successful if there was an increase in the quality and/or the quantity of the training. The second most frequent response was that WIMS would be more successful in the number of terminals in each organization was increased. The remaining recommendations ranged in frequency from 1 to 26 occurrences. The responses to questions 76 through 78 are tabulated in tables XIV, XV and XVI in Chapter IV.

Discussion of Results and Implications of Research

So far the implementation of WIMS has been successful, although only to a limited degree. This study showed that WIMS is more successful now than it was in 1984. I think as the Engineering and Services community continues to use

WIMS, more of the potential of WIMS will be realized. It appears that people, as they have more time to use the system, are becoming more accepting of it. Based on the results of the regression analysis, the Air Force needs to develop strategies which will reinforce the fact that using WIMS will increase an individual's job performance. It is also important to convince the users and future-users that it is urgent that WIMS be implemented now. Based on the responses which were received on how to increase the success of WIMS, there is a definite need for better user training. Because it would not be feasible to send each WIMS user to receive specialized training, alternative methods of training must be investigated. The results of this study also indicated that the users are frustrated because of the limited number of computer terminals that are available. Since the responses to the survey are based on the perceptions of the users, I think that each organization should perform an analysis to determine whether or not the existing equipment is located for maximum usage and availability. If the organization determines that they are receiving the maximum benefit from their equipment and that there is still a need for additional equipment, the organization should initiate actions to acquire the needed equipment. However, if the organization discovers that by relocating the existing equipment it will be more effectively used, they should consider this option first.

Recommendations

It is the responsibility of the system administrator to be sensitive to the needs of the users in his organization and to be aware of the users' attitudes towards WIMS in his organization. As a minimum, the system administrator should survey the people in his organization on an annual basis to determine what the attitudes of the users are and to receive feedback on how well the users perceive that the system is being managed. Encourage the users to provide feedback on the system so that the system administrators can learn what they are doing right and also those areas which need improvement. Continue to have the system administrators from the different organizations meet at least annually to share ideas/programs which have been successful in their organizations so that other organizations may benefit.

It is also important for the system administrator to try to manage the expectations of the users so that the users do not expect too much or too little from the system. The system administrator could accomplish this by briefing the people as they initially gain access to the system. If the user's perception of the capability of the system is accurate, there is less chance that user will feel as frustrated when he uses the system. Also during this initial briefing, the system administrator should reinforce the fact that using WIMS will positively affect the individual's ability to perform his job.

There is also a need for self-teaching, WIMS user manual to be written which will enhance the user training, especially in the organizations where the information management system's office is not formalized within the organization. This manual could be supplemented by the system information which is specific to a particular location.

It is also important to provide additional training for the user who wants to excel in his knowledge of the system. Not only will this eventually reduce the frustration of the individual, but the more highly-trained user should be able to share his knowledge with the other people in his section. As the users become better trained and more independent, the system administrator will have more time to concentrate on developing new applications and on maintaining the system. Ultimately, WIMS can only be successful if it continues to evolve and grow.

The Air Force should also provide training for system administrators to prepare them not only for the technical aspects of operating the system, but also for the people oriented problems that he will eventually have to deal with. The system administrator needs to be aware of the different types of demands that the people in the organization will require of him.

The system administrator should also perform an equipment utilization evaluation to determine the real

equipment needs of for his organization and not just the perceived needs. This will help the system administrator to better determine what new equipment if any is actually needed.

Finally, there is need for the study of the success of WIMS to be continued using the 1984 and 1985 research as a foundation so that the Air Force can be aware of what strategies are most effective in maximizing the benefits of WIMS.

Appendix A: Research Questionnaire

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (AU)
WRIGHT-PATTERSON AIR FORCE BASE, OH 45433

29 APR 1985

REPLY TO ATTN OF: LS (Capt McMullin, AUTOVON 785-6569)

SUBJECT: Attitude Questionnaire for the Work Information Management System (WIMS)

TO:

1. Please take a few minutes to complete the questionnaire. You do not need to give your name. Just complete the questionnaire, seal the completed computer score sheet in the attached envelope and give it to your WIMS System Administrator within 5 working days. Your WIMS System Administrator will then forward all of the responses from your organization to the researcher.

2. The attached questionnaire was prepared by a researcher at the Air Force Institute of Technology, Wright-Patterson AFB, Ohio. The researcher will use the results of the survey to evaluate the relationship between the attitude of WIMS users and the success of WIMS. This questionnaire may appear familiar since this study is a continuation of a study initiated last year.

3. Although your participation in this survey is voluntary, your input will be extremely valuable in the overall evaluation of the success of WIMS throughout the Air Force. Thank you for your cooperation.

Larry D. Smith

LARRY D. SMITH, Colonel, USAF
Dean
School of Systems and Logistics

3 Atch
1. Questionnaire (USAF SCN 85-43)
2. Computer Score Sheet
3. Return Envelope

ATTITUDE QUESTIONNAIRE FOR THE
WORK INFORMATION MANAGEMENT SYSTEM (WIMS)

This questionnaire is divided into four parts. The first part asks for information on your duty location, education level, computer experience, years of service, and age. The second part asks for your evaluation of how WIMS has changed certain characteristics of your work. Your opinions toward various aspects of WIMS is then sought in the third part. Part four considers the degree to which WIMS is utilized within your division.

Please provide only one answer to each question, and mark your answer against the corresponding number on the attached computer score sheet. It is not necessary to complete the sections of the score sheet which ask for your name, date and identification number. Use a number 2 pencil, and insure you do not mark outside the boxes provided for your answers.

Part I

Questions 1 and 2 apply to the HQ/MAJCOM/AFRCE to which you are assigned. Please answer only one of the two.

1.

1.	AAC	4.	AFSC	7.	PACAF	10.	TAC
2.	AFCC	5.	ATC	8.	ATC		
3.	AFLC	6.	MAC	9.	SPACECOM		

2.

1.	AFESC	4.	HQ USAF	7.	AFRCE (ER)
2.	USAFE	5.	AFRCE (BMS)	8.	AFRCE (UK)
3.	HQ AFR	6.	AFRCE (CR)	9.	AFRCE (WR)

3. What is your highest educational level?
   1. Non-high school graduate
   2. High school graduate or GED
   3. Some college but no degree
   4. Bachelor's degree
   5. Master's degree
   6. Doctoral degree

4. How much experience have you had with computers or management information systems prior to WIMS?

1.	0 to 6 months	4.	1.5 to 2 yrs	7.	3 to 3.5 yrs
2.	7 to 12 months	5.	2 to 2.5 yrs	8.	3.5 to 4 yrs
3.	1 to 1.5 yrs	6.	2.5 to 3 yrs	9.	Over 4 yrs

5. How many years of service do you have (military and/or civil service)?

1.	4 yrs or less	4.	13 to 16 yrs	7.	25 to 28 yrs
2.	5 to 8 yrs	5.	17 to 20 yrs	8.	29 to 32 yrs
3.	9 to 12 yrs	6.	21 to 24 yrs	9.	Over 32 yrs

6. What is your age group?

1.	20 yrs or under.	6.	41 to 45 years.
2.	21 to 25 years.	7.	46 to 50 years.
3.	26 to 30 years.	8.	51 to 55 years.
4.	31 to 35 years.	9.	56 to 60 years.
5.	36 to 40 years.	10.	Over 60 years.

Part II

Please use the following scale to answer questions 7 through 14:

1	2	3	4	5	6	7
Large Decrease	Moderate Decrease	Small Decrease	No Change	Small Increase	Moderate Increase	Large Increase

NOTE: If a question does not apply to you, do not answer it nor mark the score sheet for that question.

7. How has WIMS changed your productivity?

8. How has WIMS changed your accuracy in decision-making?

9. How has WIMS changed your response time for making decisions?

10. How has WIMS changed the amount of information you use in your decision-making?

11. How has WIMS changed the amount of time you spend in preparing reports?

12. How has WIMS changed the amount of time you spend in reducing (consolidating) data?

13. How has WIMS changed the availability of information that you need to do your job?

14. How has WIMS changed the speed at which you circulate information in your work?

Please use the following scale to answer question 15:

1	2	3	4	5	6	7
Large Failure	Moderate Failure	Small Failure	No Change	Small Success	Moderate Success	Large Success

15. How has WIMS succeeded or failed? (You may amplify your response to this question on a separate piece of paper and enclose it with your computer score sheet)

Part III

You are asked to read the following statements (16 through 71) and to select the number that reflects most clearly to you how you feel about each statement. The key for your responses is as follows:

1	2	3	4	5
Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

Please keep in mind that what is important to you is your own opinion. WIMS is a system that has just been introduced to the MAJCOMS, AFRCES and Air Staff. It will be introduced to Air Force bases world-wide over the next four years. Your response to this questionnaire is important, BUT YOUR RESPONSE MUST REFLECT YOUR TRUE OPINION - PLEASE BE HONEST.

Each statement implies "since WIMS was implemented." Therefore, respond to each statement as it applies to the situation since WIMS became operational.

16. My job is more satisfying.
17. Others can better see the results of my efforts.
18. It is easier to perform my job well.
19. The accuracy of information I receive is improved by WIMS.
20. I have more control over my job.
21. I am able to improve my performance.
22. Others are more aware of what I am doing.
23. The information I receive from WIMS makes job easier.
24. I spend less time looking for information.
25. I am able to see better the results of my efforts.
26. The accuracy of my work is improved as a result of using WIMS.
27. My performance is more closely monitored.
28. The division/directorate/section performs better.
29. I need to communicate with others more.
30. I need the help of others more.
31. I need to consult others more often before making a decision.
32. I need to talk with other people more.
33. The individuals I work with are changing.
34. The management structure is changing.
35. WIMS does NOT require any changes in division/directorate/section structure.
36. I have had to get to know several new people.
37. Individuals set higher targets for performance.
38. The use of WIMS increase the Air Force's performance.
39. This project (WIMS) is technically sound.
40. Air Force goals are more clear.
41. My counterparts in other divisions/directorates/sections identify more with the Air Force's goals.
42. The patterns of communication are more simplified.
43. My goals and the Air Force's goals are more similar.

1	2	3	4	5
Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree

44. The aims of my counterparts in other divisions/directorates/ sections are more easily achieved.
45. My personal goals are better reconciled with the Air Force's goals.
46. Top management provides the resources to implement WIMS.
47. People accept the required changes.
48. Top management sees WIMS as being important.
49. Implementing WIMS is difficult.
50. Top management does not realize how complex this change is.
51. People are given sufficient training to utilize WIMS.
52. This project is important to top management.
53. There is adequate staff to successfully implement WIMS.
54. My counterparts in other divisions/directorates/sections are generally resistant to changes of this type.
55. Personal conflicts have NOT increased as a result of WIMS.
56. The developers of WIMS provide adequate training to users.
57. The developers of WIMS do not understand management problems.
58. I enjoy working with those who are implementing WIMS.
59. When I talk to those implementing WIMS, they respect my opinions.
60. WIMS costs too much.
61. I am supported by my boss if I decide not to use WIMS.
62. Decisions based on WIMS are better.
63. The results of WIMS are needed now.
64. WIMS is important to me.
65. I need WIMS.
66. It was important that WIMS be used soon.
67. This project is important to my boss.
68. WIMS should have been put into use earlier.
69. It was urgent that WIMS be implemented.
70. The sooner WIMS was in use the better.
71. Benefits outweigh the costs.

Please answer Part IV on the following page.

Part IV

Please answer the following questions as they pertain to the utilization of WIMS in the performance of your job. **Return this page of the questionnaire with your computer score sheet.**

72. WIMS contains ____ percent of the information I need to perform my job.

73. The information in WIMS is ____ percent accurate.

74. I spend ____ percent of my day using WIMS.

75. On the average, I feel frustrated using WIMS ____ percent of the time.

76. List three ways that WIMS has positively influenced your ability to do your job.

_____
_____
_____
_____
_____
_____

77. List three ways that WIMS has negatively affected your organization.

_____
_____
_____
_____
_____
_____

78. How would you change WIMS within your organization in order to make it more successful?

_____
_____
_____
_____
_____
_____

THANK YOU FOR YOUR COOPERATION

Appendix B: Raw Data File

The following data consists of 220 cases. Each case consists of 80 consecutive answers on two lines of data starting in column three. Answers shown here are one unit less than actual answers. Blanks represent missing values. The value of 0 in the last position of each record indicates that the data is from the 1985 study.

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   13059544501655333333344333333313232334443332313411343243133113334332333497409900
  6 40235345115451331233333313312332212332232224340034124403311333333333496504940
  6 30156566666654443343433432100022223433233234341244321314310444444444697929090
  6 20016556664663232442 32312112222233332222232311333223133222333222233322223        0
  6 404533560063 232311331323312131131132 2212211333313113122222333       2984 1640
  6 20896555  655444334433333321111131133313313 33113231331332233 333 333496449940
  6 28156566646544444443344434111134334433443432441134313214322334444344848884940
  6 48553333333331111111111111111111311131111113131133313313311111113111399849099 0
  6 38127466665453433344334333212224011433342423332133314203312344444444419841994 0
  6 31674556006553333233342233111122322341132323331233323314311444432223414841991 0
  6 40125456  666333433333331411112221333223241034324312314232223322414880939 0
  6 28564333603153223332333313312333232433333323333321222322133333333219792609 0
   0301366660066 333433333342322222222333222222222122222232222222222288888879 0
   03019          222222  22 22222222 22222 2222222222   2    2    22 22  2        0
   02822335531443111211133311231111323122210111132334131132233322221131111096491900
   04844       55523232333332333333333333333333333243203111123333233333 333094991900
   04344333311566333333333331333232233333333311333133133 098494940
   03001333333333222222222222222222222222222222222222222 22222222222222    99  0
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   037774435333543334433333333222232312332
232223333313313133311233233443490  90040
   030024345354342232223333132342323232323
222223344444322323223222222222279641909 0
   048345546225442233132332112211111311231
122113134313313313212244444444441974099 0
   024335454233453333333333222311111132332
223233233203123123322233332333319840409 0
   028656606006664444444444444221133223442
223233233224222204401244443444          0
   021553333333331111111111111111111211131
212213233113113112323131111333399  99  0
   03647                                  32
     43411 331 21  1        33 399  99  0
   050353343334 42222222332232232322232233
212221232212122222322233333443948990  0
   038023333115552222123 32223111131232232
232223333313132113211223334333          0
  9 160366660066544444444444444111144233444
444444133314111144321334444444464886409 0
  3 283756630051533333312334342211131333333
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Appendix C: First Iteration Communalities and Rotated Factor Matrix for User Attitudes

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V16	0.68182	0.78799	0.19459	0.05033	0.03327	0.12403	0.06078	-0.01761
V17	0.68359	0.70358	0.08542	-0.05611	-0.15079	0.09145	0.38272	0.02332
V18	0.72771	0.79946	0.27613	0.08204	0.02760	0.02625	-0.06418	0.00573
V19	0.57475	0.67385	0.28935	0.11882	0.01001	0.12792	0.03711	0.07069
V20	0.64601	0.73471	0.21579	0.07076	0.04764	0.22368	-0.04814	-0.00458
V21	0.77411	0.78324	0.36973	-0.05694	-0.06577	0.12028	-0.03991	0.01784
V22	0.57518	0.63418	0.02140	-0.13361	-0.01460	0.13480	0.33415	0.15697
V23	0.58985	0.67392	0.30148	0.13901	0.04788	0.07756	0.12488	0.03948
V24	0.57417	0.68456	0.29269	0.02593	-0.01700	0.13208	-0.01621	0.03475
V25	0.69827	0.77788	0.18915	0.09974	0.02764	0.17225	0.07200	0.10878
V26	0.71797	0.78599	0.27411	0.03873	0.03354	0.14281	-0.04134	0.01816
V27	0.42823	0.33062	-0.11755	-0.14733	0.13705	0.12417	0.49890	-0.01708
V28	0.51359	0.45564	0.30626	0.18491	-0.08526	0.40425	-0.02601	-0.08146
V29	0.57490	0.04252	-0.00521	-0.07337	0.74887	-0.00834	0.00961	0.08195
V30	0.60139	-0.05051	-0.10008	-0.12229	0.75512	0.04089	0.00029	0.04466
V31	0.56790	-0.04641	-0.10698	-0.13498	0.71489	0.11395	-0.01495	-0.10868
V32	0.65464	-0.06877	0.01364	-0.00327	0.79432	0.07122	0.00752	-0.11678
V33	0.30306	0.14978	0.06870	-0.11032	0.20264	0.46200	0.07621	0.05851
V34	0.33575	0.19525	0.11528	0.01653	0.16238	0.47991	0.16533	0.00618
V35	0.18555	-0.00180	0.12221	-0.12117	-0.11329	-0.31777	0.20263	0.03256
V36	0.31335	0.30369	0.00867	-0.11344	0.29329	0.29302	-0.00046	0.19052
V37	0.41508	0.48186	0.10388	0.01819	0.24190	0.30427	0.14109	0.02764
V38	0.64139	0.60654	0.45345	0.09313	-0.02772	0.23211	0.01696	0.06543
V39	0.41911	0.41465	0.37159	0.12148	-0.10494	0.28331	-0.05462	0.00877
V40	0.53322	0.44217	0.14438	0.12844	-0.03033	0.50955	0.18621	0.07161
V41	0.54005	0.44847	0.15483	0.04432	-0.12462	0.53569	0.10185	0.01102
V42	0.58750	0.48704	0.37625	0.22763	-0.00711	0.39361	0.04112	0.01572
V43	0.50280	0.38524	0.12594	-0.01581	-0.19931	0.47383	0.04332	0.26863
V44	0.45342	0.35475	0.21985	0.13441	0.02869	0.50603	0.01145	-0.06446
V45	0.51183	0.55661	0.07107	-0.01466	-0.08523	0.38979	0.06838	0.18132
V46	0.24713	-0.05156	0.09049	0.30003	-0.11024	0.04855	0.35155	0.09037
V47	0.29239	0.03340	0.07740	0.43655	-0.04175	0.23418	0.17068	-0.09482
V48	0.56401	-0.12331	0.43523	0.18877	0.09635	0.20654	0.49145	0.17400
V49	0.42875	-0.22720	0.11431	-0.51577	0.16414	-0.01338	0.05107	0.26136

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V50	0.21776	-0.05480	-0.09399	-0.45137	-0.02117	-0.03518	0.01185	-0.01888
V51	0.51857	0.12486	-0.04837	0.69571	0.04180	0.03729	0.11362	0.02399
V52	0.51610	0.01245	0.30465	0.13160	0.02511	0.10874	0.61009	0.14542
V53	0.28074	0.12920	0.01020	0.25969	-0.09638	-0.04431	0.35483	-0.24361
V54	0.14967	0.22292	0.00083	-0.26470	0.05929	-0.06939	0.08591	-0.11914
V55	0.25075	0.00407	0.13781	0.45373	-0.08278	-0.02787	0.03085	0.13149
V56	0.44103	0.06612	-0.08444	0.62882	-0.04448	-0.02737	0.10875	0.13987
V57	0.42321	0.03245	-0.02927	-0.49753	0.11634	0.05812	0.01242	-0.39585
V58	0.58884	0.23989	0.24041	0.12706	-0.05510	0.11150	0.12365	0.65315
V59	0.40770	0.08562	0.11256	0.21368	0.00226	0.02090	0.06446	0.58090
V60	0.26774	-0.22869	-0.31643	-0.27697	0.09465	-0.01800	0.15195	-0.07891
V61	0.12414	-0.19948	-0.00982	-0.09410	-0.19324	0.05559	-0.18606	0.01872
V62	0.47749	0.49447	0.36079	0.25270	-0.10161	0.14592	0.03180	-0.07960
V63	0.42949	0.21758	0.60600	0.07350	-0.04012	0.07833	0.03928	-0.01493
V64	0.72332	0.47360	0.67672	0.08048	-0.06510	-0.04119	0.02062	0.16804
V65	0.72633	0.40786	0.71009	0.15981	-0.10126	0.00452	0.01874	0.13993
V66	0.61341	0.23163	0.72062	-0.02195	-0.00700	0.06228	0.04786	0.18372
V67	0.45815	0.18057	0.47709	0.10639	0.15064	0.06747	0.38210	0.11557
V68	0.68730	0.19356	0.76264	-0.23493	0.01194	0.08965	0.03027	0.06267
V69	0.58472	0.21805	0.69653	-0.05083	-0.06611	0.14136	0.15787	0.01245
V70	0.74009	0.31749	0.77798	-0.03541	-0.03480	0.14163	0.09575	0.04845
V71	0.55781	0.28444	0.65638	0.17617	-0.03704	0.01720	0.10861	-0.03960

Appendix D: Second Iteration Communalities and Rotated Factor Matrix for User Attitudes

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V16	0.67442	0.76030	0.21049	0.20683	0.03005	0.09114	0.00446	0.00742
V17	0.66795	0.70551	0.07634	0.16648	-0.16391	-0.00721	0.33068	0.01992
V18	0.74815	0.80449	0.29312	0.05092	0.01503	0.07651	-0.07121	0.03581
V19	0.59289	0.67634	0.30422	0.12254	-0.00145	0.13510	0.06252	0.07567
V20	0.65549	0.71939	0.23471	0.26121	0.04892	0.08639	-0.06918	0.00415
V21	0.76763	0.76369	0.38378	0.17196	-0.07133	-0.02750	-0.03245	0.02572
V22	0.53884	0.62308	0.00989	0.19895	-0.02569	-0.10462	0.28622	0.13042
V23	0.60385	0.67805	0.30677	0.08536	0.03966	0.16163	0.11582	0.03986
V24	0.57954	0.67738	0.30297	0.15862	-0.02044	0.05397	0.00562	0.01956
V25	0.71551	0.77776	0.19629	0.20096	0.02158	0.10439	0.07762	0.11953
V26	0.71601	0.77135	0.28993	0.17885	0.02316	0.05486	-0.02750	0.02623
V27	0.36132	0.32041	-0.12463	0.19182	0.11232	-0.06346	0.43372	-0.03974
V28	0.53257	0.41071	0.32436	0.43755	-0.05705	0.23426	-0.04351	-0.08484
V29	0.55594	0.05211	-0.00642	-0.02141	0.73467	-0.07674	0.02713	0.07978
V30	0.60471	-0.02624	-0.11235	0.01065	0.75655	-0.12923	0.04686	-0.00548
V31	0.58481	-0.02841	-0.11676	0.06998	0.73185	-0.12050	-0.00344	-0.12387
V32	0.65695	-0.06948	0.00459	0.03765	0.79952	0.02062	0.02863	-0.10102
V33	0.32036	0.10474	0.06562	0.48734	0.23179	-0.10823	0.03081	0.03459
V34	0.30462	0.19129	0.10902	0.42397	0.17180	0.02115	0.21220	-0.03738
V36	0.30525	0.30789	0.01413	0.28194	0.28658	-0.14369	0.02715	0.16509
V37	0.40843	0.46497	0.10870	0.31790	0.23572	0.03517	0.14451	0.04089
V38	0.64489	0.57770	0.46799	0.27679	-0.01911	0.09737	-0.00525	0.07521
V39	0.40824	0.40414	0.38006	0.26754	-0.08663	0.14189	-0.00903	-0.03416
V40	0.54096	0.39858	0.15091	0.54640	-0.02266	0.15345	0.18390	0.05362
V41	0.58306	0.37395	0.16513	0.62541	-0.11182	0.08847	0.06635	0.00908
V42	0.56291	0.45190	0.38911	0.40078	-0.00022	0.20719	0.01954	0.05795
V43	0.52101	0.32266	0.13366	0.54349	-0.17657	-0.00919	0.05446	0.26347
V44	0.43910	0.31536	0.23062	0.50078	0.05703	0.17453	-0.00156	-0.04437
V45	0.53581	0.48927	0.08348	0.48800	-0.08686	0.00061	0.05279	0.20243
V47	0.29206	0.02595	0.08544	0.20767	-0.02249	0.46469	0.14008	-0.06995
V48	0.58285	-0.10026	0.40124	0.14828	0.09236	0.16687	0.57437	0.15343
V49	0.38013	-0.18185	0.07754	-0.05314	0.18217	-0.52334	0.12015	0.12929
V51	0.54779	0.08885	-0.01903	0.03774	0.04692	0.70879	0.02223	0.18175
V52	0.66135	0.04225	0.26851	0.05412	0.00822	0.15851	0.73760	0.12365
V53	0.19613	0.10302	0.01544	0.00628	-0.09653	0.32932	0.21790	-0.14139

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V55	0.23778	0.01658	0.14034	-0.07217	-0.07459	0.41878	0.07046	0.16339
V56	0.49341	0.02174	-0.06013	0.01198	-0.03903	0.63396	0.00754	0.29273
V57	0.38221	0.03962	-0.04637	0.08565	0.13693	-0.38786	-0.01430	-0.44918
V58	0.58187	0.20443	0.24135	0.16991	-0.05414	0.02279	0.09612	0.66353
V59	0.38468	0.07290	0.12575	0.05349	0.01603	0.14819	0.05502	0.57918
V60	0.25549	-0.20027	-0.33296	-0.03098	0.09618	-0.25879	0.13090	-0.10100
V62	0.49210	0.45183	0.38285	0.20153	-0.10876	0.29526	-0.00005	-0.04178
V63	0.43988	0.18265	0.62088	0.10707	-0.04408	0.07824	0.03004	0.02430
V64	0.71243	0.42257	0.69030	0.07309	-0.07898	0.04799	-0.01868	0.20765
V65	0.71803	0.36078	0.72157	0.09052	-0.11048	0.13129	0.00657	0.17185
V66	0.63968	0.18760	0.73264	0.12084	-0.01628	-0.05979	0.05711	0.21453
V67	0.42420	0.17038	0.46310	0.11356	0.12315	0.09866	0.35996	0.11551
V68	0.69048	0.18613	0.75684	0.10085	0.01441	-0.25566	0.07756	0.03555
V69	0.58617	0.21474	0.69161	0.13756	-0.06546	-0.05484	0.18845	0.00026
V70	0.74192	0.30189	0.77489	0.15909	-0.03676	-0.05198	0.13869	0.04172
V71	0.56669	0.28514	0.65795	0.01054	-0.02099	0.19552	0.11431	-0.02526

Appendix E: Third Iteration Communalities and Rotated Factor Matrix for User Attitudes

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V16	0.67141	0.75235	0.22295	0.21535	0.03570	0.07828	-0.02593	0.03507
V17	0.61896	0.69626	0.06946	0.20679	-0.14943	-0.06778	0.21687	0.11245
V18	0.74827	0.79366	0.31004	0.05855	0.02045	0.07001	-0.09839	0.06188
V19	0.60749	0.69096	0.30013	0.09782	-0.01056	0.13071	0.10934	0.03561
V20	0.65503	0.71433	0.24746	0.25906	0.05099	0.09840	-0.06419	-0.00261
V21	0.76849	0.75103	0.39696	0.18600	-0.06217	-0.03230	-0.06546	0.05538
V22	0.53410	0.61749	0.00332	0.23540	-0.01575	-0.15144	0.18515	0.19977
V23	0.61719	0.69535	0.29640	0.06973	0.03064	0.13184	0.15021	0.00899
V24	0.58921	0.68730	0.30097	0.14478	-0.02610	0.05133	0.03971	-0.01980
V25	0.71795	0.77794	0.19844	0.20174	0.02050	0.10696	0.06944	0.12648
V26	0.71942	0.77481	0.29630	0.16141	0.02285	0.06753	-0.00734	0.01023
V27	0.30785	0.32515	-0.14229	0.20298	0.12223	-0.09888	0.33688	0.04984
V28	0.53789	0.41800	0.32699	0.42498	-0.06380	0.22710	0.02363	-0.13943
V29	0.55123	0.04928	-0.00545	-0.03221	0.73356	-0.04825	0.03438	0.07825
V30	0.59469	-0.01706	-0.12314	-0.00371	0.74747	-0.10956	0.07705	-0.05063
V31	0.59345	-0.03854	-0.11482	0.08382	0.74162	-0.10690	-0.03658	-0.09481
V32	0.65862	-0.07196	0.00295	0.03296	0.80212	0.02619	0.03409	-0.08432
V33	0.32670	0.09643	0.07360	0.49074	0.24376	-0.09631	0.01760	0.04642
V34	0.31019	0.21219	0.08941	0.39661	0.16909	0.01500	0.25788	-0.06748
V36	0.29694	0.30357	0.02149	0.27551	0.29294	-0.12085	0.01324	0.16683
V37	0.40672	0.46497	0.10888	0.31272	0.24294	0.03025	0.12183	0.07810
V38	0.64195	0.57875	0.47468	0.26017	-0.02048	0.09897	0.03859	0.04785
V39	0.44663	0.42993	0.36717	0.23738	-0.10868	0.13718	0.11420	-0.16419
V40	0.54606	0.41674	0.13826	0.51827	-0.02819	0.16087	0.24030	0.01595
V41	0.58677	0.36950	0.17065	0.62987	-0.10419	0.09461	0.06480	0.01950
V42	0.56098	0.44816	0.39848	0.39438	0.00185	0.20059	0.04732	0.05769
V43	0.51853	0.31440	0.14340	0.54959	-0.17155	0.01246	0.05287	0.25434
V44	0.45190	0.30500	0.24037	0.51651	0.06320	0.17120	-0.00004	-0.03175
V45	0.54731	0.47583	0.09673	0.49987	-0.07737	0.02744	0.01977	0.23353
V47	0.31531	0.04924	0.06598	0.18730	-0.04365	0.44467	0.23574	-0.13506
V48	0.61824	-0.06259	0.34776	0.11840	0.07242	0.10007	0.67090	0.11830
V49	0.35499	-0.17681	0.05964	-0.05131	0.18517	-0.51103	0.10704	0.10319
V51	0.61264	0.07767	0.00137	0.02459	0.04432	0.74079	0.04302	0.23112
V52	0.66986	0.08765	0.20121	0.03843	-0.01091	0.05574	0.77472	0.12959

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V56	0.53830	0.00593	-0.03579	0.01207	-0.04255	0.64411	0.00757	0.34655
V57	0.33401	0.03171	-0.05306	0.10420	0.15953	-0.39115	-0.09793	-0.36234
V58	0.51698	0.19643	0.25773	0.15819	-0.05837	0.05339	0.12153	0.60491
V59	0.31403	0.06836	0.13857	0.05515	0.00228	0.15129	0.08841	0.50636
V60	0.23585	-0.21258	-0.33345	-0.00909	0.11896	-0.25472	0.01366	0.01295
V62	0.50118	0.45952	0.38477	0.17808	-0.11498	0.29762	0.06176	-0.06819
V63	0.45024	0.16565	0.63129	0.12152	-0.03586	0.05741	0.02699	0.06476
V64	0.73281	0.40570	0.70927	0.06933	-0.07298	0.06285	-0.00276	0.22595
V65	0.72180	0.35731	0.72757	0.07261	-0.11468	0.14272	0.07426	0.14310
V66	0.67896	0.16450	0.74926	0.13623	-0.00561	-0.07126	0.05125	0.25341
V67	0.43599	0.18801	0.43871	0.08329	0.11881	0.07767	0.40682	0.12482
V68	0.69644	0.17364	0.75448	0.11519	0.02401	-0.27243	0.07781	0.05414
V69	0.57849	0.21403	0.67794	0.14271	-0.06160	-0.08701	0.20229	0.02066
V70	0.73914	0.29524	0.76786	0.16818	-0.03216	-0.07548	0.15463	0.05855
V71	0.55756	0.29469	0.64420	0.00491	-0.03216	0.14395	0.17657	-0.05257

Appendix F: Final Communalities and Rotated Factor Matrix for User Attitudes

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V16	0.67115	0.75609	0.21060	0.21625	0.03925	0.06884	-0.02624	0.03735
V17	0.59969	0.69104	0.07311	0.21282	-0.13830	-0.05952	0.20277	0.08788
V18	0.75435	0.80091	0.30196	0.04982	0.02087	0.07080	-0.10108	0.05975
V19	0.60486	0.69816	0.28257	0.09905	-0.01082	0.10891	0.11231	0.05645
V20	0.65511	0.71898	0.23646	0.25827	0.05438	0.09183	-0.06460	-0.00026
V21	0.77147	0.75814	0.39346	0.17655	-0.06043	-0.02258	-0.06912	0.04202
V22	0.52500	0.61119	0.00053	0.24982	-0.00376	-0.16135	0.17427	0.18061
V23	0.61520	0.70234	0.27974	0.06713	0.03025	0.11613	0.15512	0.02635
V24	0.58253	0.69091	0.28575	0.13210	-0.03271	0.04838	0.05108	-0.00701
V25	0.71736	0.78147	0.19034	0.20005	0.02506	0.10195	0.06597	0.12261
V26	0.71412	0.77948	0.28169	0.14923	0.01779	0.06460	0.00147	0.02052
V27	0.28886	0.31706	-0.13093	0.20334	0.12699	-0.08214	0.32576	0.02928
V28	0.52290	0.42809	0.31242	0.41924	-0.06419	0.21750	0.03193	-0.11758
V29	0.54774	0.04699	-0.00190	-0.03698	0.73179	-0.04631	0.03713	0.07157
V30	0.60274	-0.02000	-0.12375	0.01171	0.75050	-0.12691	0.07377	-0.04578
V31	0.59884	-0.04367	-0.10071	0.08450	0.74596	-0.08757	-0.04290	-0.11698
V32	0.66383	-0.07313	0.01220	0.02500	0.80340	0.04272	0.03582	-0.09565
V33	0.32794	0.09636	0.07525	0.49105	0.24655	-0.09453	0.01782	0.04277
V34	0.31057	0.21600	0.08797	0.39780	0.17211	0.00991	0.25518	-0.05561
V36	0.30024	0.30357	0.02605	0.27887	0.29834	-0.12489	0.00323	0.15820
V37	0.40941	0.46596	0.10798	0.31563	0.24881	0.02632	0.11407	0.07342
V38	0.64023	0.58931	0.46297	0.25448	-0.02189	0.08947	0.04050	0.06093
V39	0.41919	0.43895	0.33790	0.24252	-0.11041	0.10159	0.12857	-0.12032
V40	0.54516	0.42189	0.13256	0.51163	-0.02968	0.15974	0.24659	0.02491
V41	0.58128	0.37418	0.17137	0.62057	-0.10228	0.10781	0.06793	0.00932
V42	0.55782	0.45664	0.39359	0.38073	-0.00156	0.20735	0.05132	0.06167
V43	0.52454	0.31681	0.14063	0.56188	-0.16025	-0.00381	0.04257	0.24735
V44	0.46361	0.31027	0.25078	0.50940	0.06793	0.19522	-0.01082	-0.04605
V45	0.54285	0.47620	0.10031	0.50523	-0.06578	0.02530	0.00581	0.21393
V47	0.31240	0.05410	0.06345	0.17859	-0.05020	0.44868	0.24020	-0.10963
V48	0.61393	-0.05614	0.34935	0.11883	0.07095	0.09108	0.66532	0.13649
V49	0.36932	-0.18163	0.06310	-0.04159	0.18788	-0.52445	0.10487	0.09632
V51	0.66036	0.08136	0.00477	0.00347	0.04077	0.76732	0.04027	0.24826
V52	0.66483	0.08649	0.20042	0.03207	-0.01610	0.05574	0.77028	0.13947

	COMMUNALITY	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6	FACTOR 7
V56	0.54303	0.00942	-0.03798	-0.00062	-0.04818	0.63906	0.00957	0.36150
V57	0.32053	0.02774	-0.03080	0.09144	0.16183	-0.33710	-0.10424	-0.39970
V58	0.55431	0.20074	0.24880	0.17238	-0.05474	0.00784	0.10974	0.63820
V59	0.33158	0.06968	0.12902	0.05806	-0.00177	0.11826	0.08698	0.53400
V62	0.50649	0.46896	0.37787	0.15992	-0.12264	0.30835	0.06913	-0.05744
V63	0.46330	0.17517	0.64048	0.11145	-0.03681	0.07649	0.01934	0.04903
V64	0.73702	0.41792	0.70824	0.05970	-0.07481	0.06569	-0.00772	0.21731
V65	0.72070	0.37138	0.71978	0.06549	-0.11771	0.13657	0.07344	0.15000
V66	0.67504	0.17521	0.75142	0.13203	-0.00515	-0.06744	0.04453	0.23607
V67	0.43834	0.19356	0.43619	0.06487	0.10954	0.08538	0.41269	0.12963
V68	0.69519	0.18200	0.75865	0.11059	0.02370	-0.25937	0.07250	0.03450
V69	0.58292	0.22308	0.68269	0.13980	-0.06156	-0.07598	0.19468	0.00903
V70	0.74704	0.30523	0.77466	0.16015	-0.03330	-0.05894	0.14748	0.04248
V71	0.52494	0.30607	0.61865	0.01329	-0.03384	0.11614	0.18187	-0.02527

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In a 1984 study, AFIT researchers statistically determined that there is a relationship between user attitudes and the perceived success of the Work Information Management System (WIMS). This research determines whether or not the relationship between user attitudes and success has changed over time, and determines if WIMS is perceived to be more successful in 1985 than it was in 1984. Finally, this research evaluates how WIMS has impacted the Major Command (MAJCOM) and Air Force Regional Civil Engineer (AFRCE) organizations based on the observations of the users. 400 surveys were distributed to 19 MAJCOM and AFRCEs. Statistical techniques were used to answer the five research questions. An effective response rate of 55.5 percent was achieved. Results indicate that the relationship between user attitudes and the perceived success of WIMS has not changed significantly, and that WIMS is perceived to be more successful in 1985 than it was in 1984. In addition, the users most frequently responded that WIMS has positively impacted the organization by enhancing the flow of information throughout the organization. The users also responded most often that WIMS has negatively impacted the organization by limiting the ability of people to perform their job when the computer system is down. Finally, the users most frequently suggested that WIMS would be more successful if there were a greater number of terminals within the organization and if the quantity and the quality of the user training was increased.

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